# VEGETATION SURVEY AND MAPPING

# OF THE

# PLATEAU MOUNTAIN CANDIDATE ECOLOGICAL RESERVE

Dr. G.C.D. Griffiths

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## ABSTRACT

Plateau Mountain Candidate Ecological Reserve is situated in the rainshadow of the continental divide at 40° 11-17' N, 114° 28 -34' W. The total area of the reserve is 5633 hectares.

This report accompanies a vegetation map prepared to the scale 1:15000, which divides the area according to 25 vegetational categories. These are characterized in detail in this report, primarily on the basis of censuses of 25 sample stands. Landforms and soils are discussed in relation to vegetation.

Comparison with the vegetation of other parts of the Alberta Rockies suggests that seven plant communities not reported elsewhere may be rare or unique to the reserve. Apart from the well-known special features of the alpine plateau, this report identifies nine previously undocumented special features in the lower alpine and subalpine zones. These include limestone pavement formations and a unique forest type with ancient limber pine growing in stands between 6100 and 6800 feet.

ACKNOWLEDGEMENTS

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and to Cartographic Services (Alberta Energy and Natural Resources) for attending to the final production of the map accompanying this report.

## PREFACE

This report is to be used in conjunction with the Vegetation Map of Plateau Mountain Candidate Ecological Reserve, available from:

Alberta Map and Air Photo Distribution Centre,
Alberta Energy and Natural Resources,
2nd Floor West, North Tower,
Petroleum Plaza, 9945-108 Street,
Edmonton, Alberta T5K 2G8

Additional copies of this report are available from the:

Natural Areas Coordinator,
Alberta Energy and Natural Resources,
4th Floor, South Tower,
Petroleum Plaza, 9945-108 Street,
Edmonton, Alberta T5K 2G8

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# 1. INTRODUCTION

This work was undertaken under contract with the Government of Alberta during the summer of 1982, primarily by the author of this report, Dr. Graham C. D. Griffiths, who is responsible for all opinions not otherwise attributed. Deirdre E. Griffiths was responsible for photography and cartography.

Geological maps are available for the area included in the candidate ecological reserve (Hume & Hage 1942, Douglas 1958, Norris 1958a, Norris 1958b). A physical land classification map has been produced by Levinsohn (1979). However, no vegetation map has previously been available. The vegetation of the alpine fellfield on the summit of Plateau Mountain is comparatively well known and has been the subject of a thesis by J. P. Bryant (1968), on which a publication by Bryant & Scheinberg (1970) is based. However, little information was available on the vegetation of other areas proposed for inclusion in the ecological reserve. Accordingly, a study of the vegetation of areas other than the plateau was needed so that a complete vegetation map could be prepared and the biological resources and special features of the reserve as a whole documented and assessed for planning purposes.

Plateau Mountain Candidate Ecological Reserve is situated at 40° 11-17' N, 114° 28-34' W in the Highwood-Livingstone Range. As presently bounded the reserve contains about 5633 hectares, of which the alpine plateau occupies about 1540 hectares. The highest point on the plateau has an elevation of 8265 feet (2519 m). The lowest elevation in the reserve is exactly 5600 feet, where Plateau Creek crosses the boundary in the NW corner. Timberline generally occurs in the range of 7000-7500 feet (2135-2300 m), with much local variation due to substrate, topography and wind exposure. A double timberline can be observed in Sentinel Pass and in the cirques on the East side of the plateau, where forested slopes extend above tundra in the centre of the pass and cirques. This phenomenon has been attributed to the effects of lower minimum temperatures on the lower ground (Trottier 1972).

Geographical names for use in describing locations in the subalpine zone are provided by the creeks on all four sides of the reserve. The northern boundary approximates to Salter Creek (forming Salter Pass), of which a major tributary known as Plateau Creek arises from several sources in the NW quarter of the reserve. Plateau Creek is formed by two main branches, Plateau Creek West rising in E1-15-5 and Plateau Creek East rising in 5 to 8-15-4. On the East side of the reserve lies the Upper Livingstone Valley, containing the sources of the Livingstone River which rises in Sentinel Pass and a series of cirques cut into the plateau. A tributary of the Livingstone River known as Dry Creek runs for some distance along the Forestry Trunk Road, which forms the southern boundary of the reserve. This creek rises in a ravine along the SW face of Plateau Mountain (running southwards through 30 to 31-14-4). To the West of this ravine lies the valley formed by a tributary of Wilkinson Creek, along which the access road to Plateau Mountain has been built. No name for this creek is given on any map. Since a name is needed and this valley is the only part of the reserve where alpine larch grows, we propose the name Larch Creek. The summit of Wilkinson Pass (over 6500 feet) on the Forestry Trunk Road lies on the divide between the valleys of Larch Creek and Dry Creek.

Altitudes are given in feet in this report. This does not reflect any objection to the metric system as such. But so long as the topographic maps issued by the Federal Government give contours in feet, it is more accurate and convenient to quote altitudes in feet. Discussion of altitudes in metres merely requires readers to convert back again to feet when using maps.

The nomenclature for vascular plants used in this report is based mainly on three standard floras (Moss 1959, Hultén 1968, Hitchcock & Cronquist 1973), except that the concepts of Draba species follow Mulligan (1976), of the Oxytropis campestris complex Elisens & Packer (1980), and of certain Senecio species Packer (1972). The species Minuartia austromontana has been described by Wolf, Packer & Denford (1979). Bryophyte nomenclature is on the authority of Dr. Diana Horton.

A photographic record was made of the landscape and vegetation of the Plateau Mountain Reserve, including details of the 25 sample stands. In total about 325 colour slides have been deposited with the Natural Areas Coordinator, Alberta Energy and Natural Resources.

Seventy-three voucher specimens of vascular plants (mostly grasses and sedges) have been deposited in the Alberta Energy and Natural Resources herbarium. Twelve selected bryophyte samples have been preserved in the University of Alberta herbarium (ALTA).

## 2. PHYSICAL COMPONENTS OF ECOSYSTEM

### 2.1. Geology

The geological maps and reports (Douglas 1958, Norris 1958b) indicate that Plateau Mountain is capped by the Rocky Mountain Formation probably of Pennsylvanian age. This formation is described as consisting dominantly of light grey, fine-grained, thick-bedded quartz sandstones (Norris 1958b) or as containing arenaceous dolomite and limestone, quartzite, sandstone and massive chert (Douglas 1958). Neither author provided any specific description of this formation on Plateau Mountain.

Below the Rocky Mountain Formation lies a series of Mississippian Formations (Etherington, Mount Head and Livingstone Formations) consisting predominantly of limestones and dolomites. According to Norris the Etherington Formation is 210 feet thick on Plateau Mountain consisting of interbedded, fine-grained, silty dolomite and limestone with thin, green, calcareous shale partings, while the Mount Head Formation is 630 feet thick consisting of alternating limestone and dolomite units rendering it divisible into six members. The Livingstone Formation consists dominantly of grey, coarse-grained, thick-bedded to massive, crinoidal limestone, variably cherty, with interbeds of grey, medium- and thick-bedded, buff weathering dolomite (Norris 1958b). These three Mississippian formations form numerous cliffs and rock outcrops around the plateau and elsewhere in the reserve.

One geological feature not previously reported is that limestone of the Livingstone Formation (det. Dr. C. R. Stelck) forms a partly unvegetated pavement showing well preserved glacial striae in NE4-15-4 at an elevation of about 7100 feet (see vegetation stand 17). Such pavement is rare in the Alberta Rockies, and must be counted as a special feature of the Plateau Mountain Ecological Reserve.

The gently sloping layering indicated above is abruptly interrupted along the West flank of Plateau Mountain by the surfacing of the McConnell thrust sheet, which extends according to Norris' map as a band (more or less one kilometre in width) of complex North-South faults. The valley of Larch Creek lies along the middle of this

fault complex. Surface outcrops along this fault zone belong to the Rocky Mountain (Pennsylvanian) or Spray River (Triassic) Formations. The bulk of the Spray River Formation appears to consist of thinly bedded, finely laminated, fine-grained, dull black siltstones (Douglas 1958), as can be seen exposed alo[illegible] Plateau Creek West in E1-15-5.

2.2. Glaciology

No glaciers or permanent snowfields presently exist on Plateau Mountain. However, permafrost persists and has been the subject of special study by Harris & Brown (1978), who concluded that permafrost extends to a depth of possibly 100 metres or more below the plateau, the upper portion (to 30 metres depth) being adjusted to the present climate and the lower layers apparently relic. As is well known, there is an ice cave at the North end of the plateau in E17-15-4. It is understood that a desire to preserve this unique feature from deterioration through uncontrolled access was the main motivation for the original designation of this half-section as Plateau Mountain Natural Area in 1971. Since Harris & Brown report that the permafrost within the cave appears to be relic, restriction of access appears necessary.

The development of patterned ground due to intense frost action has been studied on the summit of Plateau Mountain by Bryant & Scheinberg (1970) and in a more recent unpublished thesis by Woods (1977). These studies refer to the area shown as fellfield tundra on the vegetation map, where soil conditions are generally dry in summer and frost boils or stone stripes generally occupy about half the ground surface. Cryoturbation (frost boiling) of milder intensity is responsible for a quite different vegetation type, here called moist hummocky tundra, found on moist, gently to moderately sloping ground to the West of the plateau at 7300-7800 feet. In this terrain cryoturbation results in the formation of vegetated hummocks, with stones reaching the surface only to a minor extent at the bottom of hollows. This hummocky patterned ground should be considered a special feature of the reserve of comparable scientific interest to that of the well studied fellfield on the plateau.

2.3. Landforms

Information on the landforms of the reserve has been given by Karpuk & Levinsohn (1980) and the accompanying physical land classification maps (Levinsohn 1979). The reserve falls within their Subregion 6, representing the (Highwood-) Livingstone Range. They refer to the patterned ground of Plateau Mountain as a noteworthy feature of this subregion. The boundary of this patterned ground shown on Levinsohn's maps includes areas whose vegetation is here classified as alpine heath and moist hummocky tundra in addition to fellfield tundra.

It is believed that the entire plateau (rising from 7400 feet at the North end to 8265 feet at the southern peak) was above the levels of Pleistocene glaciations. Bird (1979) reports that no evidence of glaciation was found there by Dr. L. C. Hills of the Department of Geology, University of Calgary. However, a major glacier certainly originated in the Upper Livingstone Valley, as evidenced by morainal deposits (of the knob and kettle type) in cirques and in Sentinel Pass and by the presence of glacial striae on limestone pavement at 7100 feet in NE4-15-4. Ice may be assumed to have been present in all other valleys in the reserve at least at the maximum of the first Cordilleran advance, when it is believed that the general ice level in the mountains of SW Alberta rose to about 7000 feet (2100 m) (Karpuk & Levinsohn 1980). Probably only the plateau and some surrounding cliffs and screes have been continuously available to plants and animals throughout the Pleistocene.

The plateau is largely surrounded by limestone cliffs and rubbly talus screes. Only on the West side along the road route is there a rather gradual ascent. Ridges are generally clothed with a veneer of rubbly saprolite, but since much of the limestone is hard and resistant to weathering the development of deep saprolitic blankets has not occurred and saprolitic veneers are frequently complexed with bedrock outcrops. Bedrock may even be exposed on level surfaces, and forms a level pavement in NE4-15-4 (as previously discussed).

Hummocky glacial moraine (with knobs and kettles) is best developed in Sentinel Pass and in the series of four cirques South

of this pass along the East and South-East faces of the plateau. Evidently this was a major source area for the glacier which once flowed South along the Livingstone Valley. The value of these moraines for demonstration purposes has been reduced by the siting of two gas wells in the centre of cirques, with resulting disturbance caused by the wells and their access roads and pipelines. Nevertheless some undisturbed moraine remains, and these fine examples of cirque moraines should be counted as a special feature of the reserve.

Some revision of the boundaries of morainal deposits shown in the Upper Livingstone Valley on Levinsohn's maps, as well as on Bayrock & Reimchen's (1980) map, is necessary, since some bedrock ridges and limestone pavement has been included within the area shown as blanketed by moraine. It should be recognized that both studies were regional in scope and may not present sufficiently detailed and accurate information for the management of special areas such as ecological reserves. There is a disagreement between the two studies in the area of Wilkinson Pass in the SW corner of the reserve. Bayrock & Reimchen show this as ground moraine consisting of moderately leached till, while Levinsohn shows it as fluvial deposits and saprolite. Bayrock & Reimchen's designation is here assumed to be correct.

Salter Pass along the northern border of the reserve is a narrow valley with unstable talus screes on the northern slopes of Plateau Mountain reaching its floor in some places. Colluvial movement and fluvial action have probably obliterated any glacial features. The south-facing slopes of Mount Burke along the northern side of the valley show remarkably poor soil development, with limestone bedrock extensively exposed down to the valley floor (6000-6300 feet).

Surface water is scarce in the reserve after subsidence of the spring flood. There is a small cirque lake at 7100 feet in NE5-15-4. This should be rated as a special feature in view of the rarity of high altitude lakes in the Highwood-Livingstone Range. The outflow from this lake is underground. Water in the Livingstone River does not rise to the surface until near the road in the SE corner of the

reserve. There are permanent springs in the upper valley of Larch Creek, although the main creek bed becomes dry. Plateau Creek is largely dry, although briefly surfacing towards the NW corner of the reserve. Dry Creek and Salter Creek appear totally dry. Accordingly, it seems likely that scarcity of surface water may be a factor limiting the distribution of some animals in the reserve.

## 2.4. Climate

Plateau Mountain lies in the rainshadow East of the continental divide. Little climatic data has been collected within the reserve. Harris & Brown (1976) determined mean annual air temperature as - 4.1°C on the summit of Plateau Mountain and + 0.05°C in forest at 2266m (= 7485 feet, but the site shown on their map lies at about 7300 feet!). They give mean precipitation for the plateau from September 1974 to September 1976 as about 15 cm. Much higher estimates (51-63 cm annually) based on data for Raspberry Ridge and Hailstone Butte lookouts are quoted by Bird (1979). The lookout data are probably not good indicators of precipitation in the reserve in view of the considerable changes in precipitation over short distances occurring in mountains.

As is well known, strong winds occur throughout the year on Plateau Mountain, and are of ecological significance in removing most of the snow from the plateau. The effective precipitation there must consequently be very low. Strong winds are also experienced in the cirques on the East side of Plateau Mountain and probably through Sentinel Pass. No data on wind speeds has been published except for some spot readings given by Bryant & Scheinberg (1970).

## 2.5. Soils

General information on the soils of the reserve has been published on Levinsohn's (1979) physical maps. The soil of the plateau has been studied by Bryant & Scheinberg (1970), who conclude that "soils under frost boils are generally shallow lithosols, while those under turf bands are poorly developed alpine turf soils". Levinsohn included this soil in the subgroups orthic regosol and orthic humic regosol. However, the most recent edition of the

Canadian System of Soil Classification (Canada Soil Survey Committee, 1978) introduces a new category of cryosol for soils having permafrost close to the surface, especially if strongly cryoturbated. According to the new concepts the soils of the summit appear classifiable as orthic or brunisolic turbic cryosols. I have also classified the soil under moist hummocky tundra as a brunisolic turbic cryosol, although confirmation that permafrost lies sufficiently close to the surface to meet the description is needed.

Outside the cryosol area the soils of the reserve consist predominantly of orthic regosols and orthic eutric brunisols. Chernozems occur under seasonally moist carr or grassland vegetation mainly in valley bottoms, the most extensive area being the shrubby cinquefoil carr (Mp) in the Upper Livingstone Valley categorized as orthic black by Levinsohn. No doubt this is partly correct, although the sample we checked appeared classifiable as a rego black on account of the shallowness of the B layer. Smaller areas of chernozems occur along Larch Creek and probably along other creeks. No permanently wet soils (gleysols) have been found in the reserve.

Our soil data consists solely of field observations of small pits dug with a trowel at the vegetation quadrat sites. As such it is of a preliminary nature and does not constitute an adequate soil survey. With this caveat, the correlation between soil and vegetation types, which by extrapolation will allow our vegetation map to be used as a provisional soils map if so desired, appears to be as follows:

Nonsoils - The categories Br (rock barren) and Bt (talus barren) refer to unvegetated or sparsely vegetated material which does not meet the Canadian definition of soil ("unconsolidated mineral or organic material at least 10 cm thick capable of supporting plant growth", Canada Soil Survey Committee 1978). One area of patchy Dryas tundra (on limestone pavement in NE4-15-4) also fails to meet the definition of soil.

Orthic and brunisolic turbic cryosols - These are associated with fellfield tundra (Tf) and moist hummocky tundra (Tm), as discussed above.

Regosols (mostly orthic) - Shallow soils supporting tundra vegetation (Td, Te, Tk, Tt) but which are not strongly cryoturbated fall into the orthic regosol category. Some samples under scrub vegetation (Sg, Ss, Sw) are

also referred here. Some shallow stony forest soils which fail to meet the criteria for brunisols also appear to fall into the orthic regosol category by default (stand 5, Fu). Transitions between orthic regosols and orthic eutric brunisols are probably frequent. The soil of one unusual forest sample on an extreme north-facing slope (stand 20, Fo) has been classified as an orthic humic regosol.

Orthic eutric brunisols - These are the predominant forest soils of the subalpine zone. The soils beneath some scrub vegetation (Sm, Sw) and willow - dwarf birch carr (Ms), as well as one sample of moist talus tundra (Tt), also appear to fall within this category.

Chernozems - Orthic black chernozems are found on valley bottoms beneath riverine fescue grassland (Gr) and shrubby cinquefoil carr (Mp). Other samples beneath shrubby cinquefoil carr (Mp) and herb - willow carr (Ma) have been classified as rego black chernozems on account of the lack or shallowness of the B layer.

# 3. VEGETATION

## 3.1. Methods

Vegetational data was gathered following the large quadrat method used by Achuff & Corns (1981) and in my recent Beehive Survey (Griffiths 1981). One or more stands which appeared typical and homogenous was selected for each mappable plant community, and all vegetation above ground level itemized within nested quadrats (20 x 20 m for trees, 15 x 15 m for tall and low shrubs, and 10 x 10 m for dwarf shrubs, herbs and bryophytes). Two or three stands per day can be documented in this way, compared with at least two days per stand needed for multiple quadrat sampling methods. Use of the large quadrat method is preferred for extensive surveys, because it allows a much larger number of stands to be documented within the time available. Its disadvantage is that the estimates of the coverage and abundance of plant species gained by this method are crude and have indicative value only. If reliable and statistically testable estimates are needed for any purpose, additional data following some multiple sampling method should be gathered.

Our quadrat data for the 25 selected stands is attached as Appendix 1 to this report. The location of the stands is shown on Fig. 1. Interpretation of areas not visited is based on aerial photograph series no. 72-65 (scale 1:21120) and numerous ground photographs taken by Deirdre E. Griffiths.

## 3.2. Classification

For mapping purposes we have divided the vegetation of the Plateau Mountain Reserve into 25 categories, mostly representing community types, as shown in the following table together with their associated soil and landform types:

Table 1: Correlation between vegetation, soil and physical factors in Plateau Mountain Candidate Ecological Reserve

| Vegetational Type | Soil | Hygro-type | Elev-ation | Landform |
|---|---|---|---|---|
| 1. Barrens | | | | |
| (i) lichen-rock barren (Br) | nonsoil | xeric | 6000-8000 ft | bedrock outcroppings and cliffs with little or no vegetation |
| (ii) talus barren (Bt) | nonsoil | xeric | 6000-8200 ft | unstable extreme to very steep talus (colluvial) slopes |

Table 1 (cont.)

| Vegetational Type | Soil | Hygro-type | Elev-ation | Landform |
|---|---|---|---|---|
| 2. Tundra | | | | |
| (i) fellfield tundra (Tf) | orthic/ brunisolic turbic cryosol | subxeric -xeric | 7400-8265 ft | patterned ground (sorted polygons, nets and stripes), level to strongly sloping |
| (ii) moist hummocky tundra, dominated by Carex gynnoclada (Tm) | brunisolic turbic cryosol | subhygric | 7300-7800 ft | patterned ground (hummocky) on gentle to moderate slopes |
| (iii) alpine heath, dominated by Phyllodoce glanduliflora (Te) | orthic regosol | mesic | 7400-7900 ft | saprolite slopes (gently to strongly sloping) |
| (iv) Dryas tundra (Td) | nonsoil, orthic regosol | xeric | 7100-8000 ft | saprolite ridges and limestone pavement (level to strongly sloping) |
| (v) talus tundra (Tt) | orthic regosol, orthic eutric brunisol | mesic-subhygric | 6800-7900 ft | stabilized talus screes (very strongly to extremely sloping) |
| (vi) Kobresia tundra (Tk) | orthic regosol | mesic | 7000-7400 ft | hummocky moraine in cirques and passes, saprolite ridges (level to gently sloping) |
| 3. Grassland | | | | |
| (i) riverine fescue grassland (Gr) | orthic black chernozem | seasonally subhygric and subxeric | 6600-6700 ft | alluvial benches along creeks (± level) |
| 4. Carr/marsh/meadow | | | | |
| (i) herb - willow carr (Ma) | rego black chernozem | subhygric | 6900-7600 ft | alluvial benches and fans, seepage slopes (level to strongly sloping) |
| (ii) shrubby cinquefoil carr (Mp) | rego/ orthic black chernozem | seasonally subhygric and mesic | 6200-6400 ft | alluvial/morainal valley floor (level to gently sloping) |

Table 1 (cont.)

| Vegetational Type | Soil | Hygro-type | Elev-ation | Landform |
|---|---|---|---|---|
| (iii) willow - dwarf birch carr (Ms) | orthic eutric brunisol | subhygric | 6000-6200 ft | alluvial valley floor (level to gently sloping) |
| (iv) hairgrass community (Md) | unknown (alluvial mud) | subhydric (flooded in spring) | 7100 ft | muddy shore exposed by receding water of morainal lake |
| 5. Scrub | | | | |
| (i) krummholz (Sk) | unknown | mesic | 7000-7500 ft | wind-exposed sites on saprolitic and talus slopes and cirque moraines, avalanche slope |
| (ii) subalpine juniper-bearberry scrub (Sw) | orthic regosol, orthic eutric brunisol | xeric | 6200-7100 ft | stabilized saprolitic and talus slopes (strong to extreme) |
| (iii) montane aspen-juniper-bearberry scrub (Sm) | orthic eutric brunisol | xeric | 5600-6400 ft | stabilized extreme saprolitic and talus slopes |
| (iv) seral subalpine scrub (Ss) | orthic eutric brunisol | mesic-subxeric | 6300-7300 ft | burnt over strong to extreme talus slopes (formerly forested) |
| (v) gravel bar scrub, dominated by Dryas drummondii (Sg) | orthic regosol | subxeric (seasonally flooded) | 5700-6300 ft | alluvial gravel on floodplain (level to very gently sloping) |
| 6. Forest | | | | |
| (i) upper subalpine spruce-fir-larch forest (Fu) | orthic regosol | mesic | 7100-7400 ft | saprolitic saddle and slopes (level to strongly sloping) |
| (ii) upper subalpine spruce - fir - whitebark pine forest (Fw) | orthic eutric brunisol | subxeric -mesic | 6700-7500 ft | saprolitic and talus slopes (gentl to strong) |
| (iii) subalpine spruce-fir forest (Fo) | orthic eutric brunisol, orthic humic regosol | subxeric-subhygric | 5600-7100 ft | saprolitic and talus slopes (gentl to extreme) |

Table 1 (cont.)

| Vegetational Type | Soil | Hygro-type | Elev-ation | Landform |
|---|---|---|---|---|
| (iv) lower subalpine lodgepole pine forest (Fl) | orthic eutric brunisol | mesic-subxeric | 5700-6700 ft | morainal and saprolitic slopes and ridges (level to extremely sloping) |
| (v) riverine forest (Fr) | orthic eutric brunisol | mesic | 5700-6200 ft | alluvial valley floor (level to gently sloping) |
| (vi) mixed pine open forest (*Pinus flexilis* - *P. albicaulis* - *P. contorta*) (Fp) | orthic eutric brunisol | xeric | 6100-6800 ft | south-facing saprolitic and bedrock slopes (moderate to extreme) |
| 7. Others | | | | |
| (i) ground disturbed by construction (road and pipeline cuts, borrow pits etc.) (Dg) | disturbed | xeric-subhygric | 6100-8265 ft | plateau, valleys and slopes up to extreme |
| (ii) saxifrage-moss community | nonsoil | hygric-subhydric | 7500-7900 ft | vegetated cliffs (seepage) |

(Note: lowest elevation in reserve exactly 5600 feet).

3.3. Lichen-rock barren (Br)

The vegetation of poorly vegetated rock outcrops and cliffs in the reserve was not studied quantitatively. Since most outcrops and cliffs are formed by limestones, a much more depauperate epipetric lichen fauna than that described by Bryant & Scheinberg (1970) for the mainly sandstone rocks exposed in fellfield tundra on the plateau is to be expected. *Saxifraga bronchialis* often grows on dry limestone rocks with few other vascular plants.

Areas of limestone pavement with partial vegetation cover (NE4-15-4) represent an intergrade between lichen-rock barren and Dryas tundra (Td). They have been mapped as Dryas tundra, since Dryas mats occupy at least one-third of the surface.

3.4. Talus barren (Bt) (stand no. 11)

Rubbly talus screes are extensively developed around all faces of Plateau Mountain, supporting a variety of plant communities. The vegetational category talus barren is here applied to unstable screes

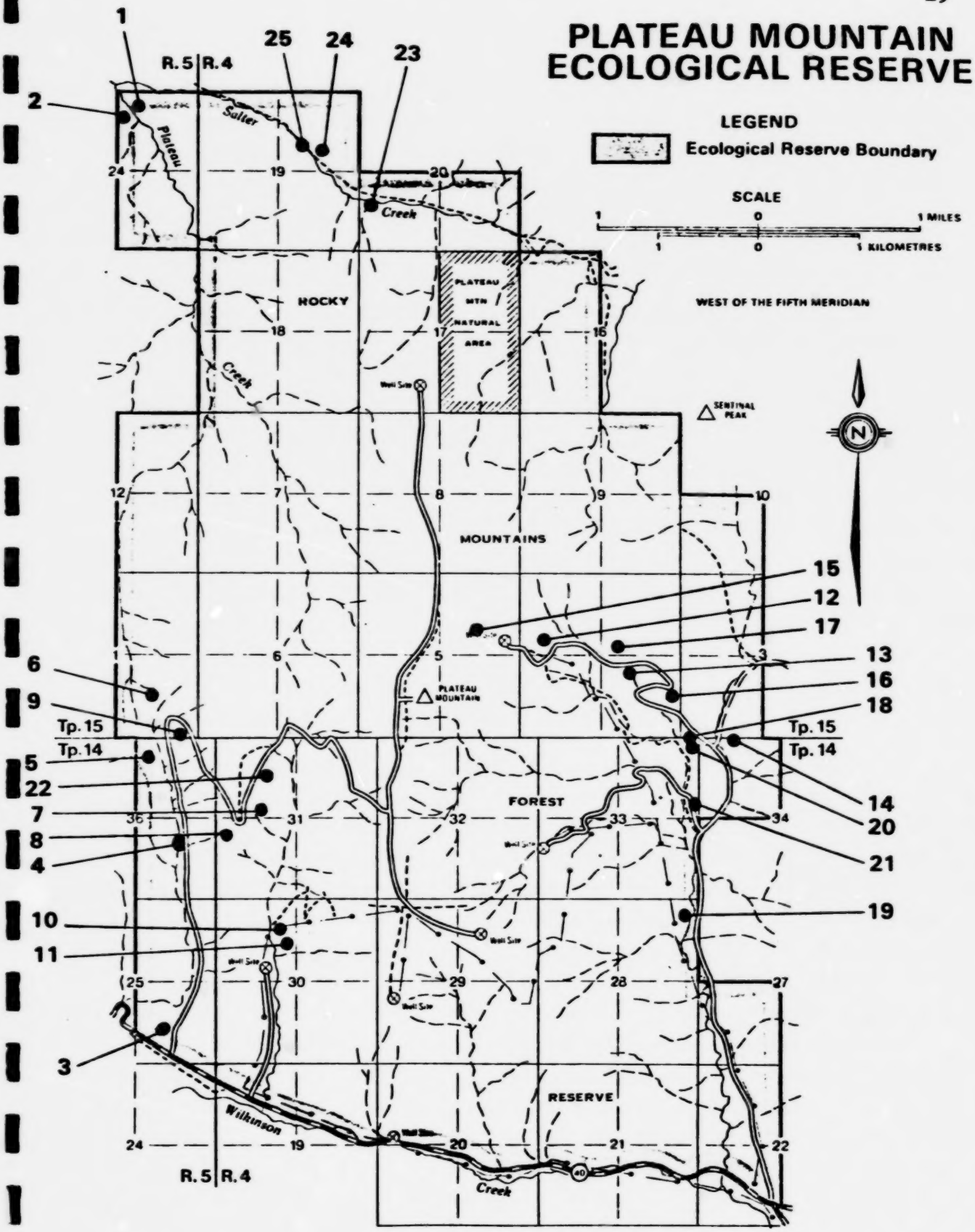


Fig. 1. Location of sample stands

which lack any continuous vegetation cover. The ground is occupied predominantly by bare rock rubble and blocks. However, a surprising diversity of vascular plants occurs with low coverage in scattered patches. The stand sampled contains 38 species of vascular plants. It is located at a site with above average protection from wind, but without any other unusually favourable conditions. Several of the plants present are lacking or rare in the continuous vegetation of stabilized talus slopes (Tt), notably Penstemon ellipticus, Artemisia michauxiana, Festuca baffinensis, Agropyron scribneri and Saussurea densa. The presence of these plant species associated specifically with unstable screes demonstrates that (at least one) distinct plant association has to be recognized on these screes and that we are not dealing merely with depauperate remnants of the vegetation of stabilized talus slopes (Tt). The high species diversity of talus barren on Plateau Mountain may be ascribed to the fact that scree slopes have been continuously available to plants throughout the Pleistocene. One species frequent in our quadrat, Agropyron scribneri, is on Packer & Bradley's (1980) Alberta list of rare plants.

No comparison with the vegetation of talus barrens in other parts of the Alberta Rockies can be made at this time, as previous studies have largely ignored this vegetation.

3.5. Fellfield tundra (Tf) (see Bryant & Scheinberg 1970)

In view of Bryant's special study of fellfield tundra on the summit of Plateau Mountain (Bryant 1968; Bryant & Scheinberg 1970), this community was excluded from our sampling program. The stony cryoturbated portions of the patterned ground features (sorted stripes, nets and polygons) are dominated by epipetric and terricolous lichens, while a closed Carex nardina - Cetraria cucullata turf occupies the stable central portions. Bryant analyzed the gradient between these extremes, which he interprets both as a microenvironmental gradient and as a cyclical successional sequence on the assumption that reversal to frost boil (the first stony phase of the sequence) can occur at any time. He proposed on the basis of phytosociological ordination of his data to divide the sequence into five stages, as follows:

Table 2: Microenvironmental and successional sequence of fellfield tundra vegetation on the summit of Plateau Mountain (after Bryant & Scheinberg 1970: 759)

(percentage cover for species exhibiting at least 1% value)

| Stages | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Lepraria neglecta | 1 | 1 | 1 | | |
| Omphalodiscus kraschenninnikovii | 5 | 16 | 1 | | |
| Dryas hookeriana | 5 | 15 | 1 | 3 | |
| Salix nivalis | 1 | 5 | 4 | 2 | |
| Tortula ruralis | 3 | | 1 | 2 | |
| Umbilicaria hyperborea | 4 | 5 | 1 | 3 | 3 |
| Lecanora caesiocinerea | 3 | 3 | 1 | 3 | 1 |
| Cetraria ericetorum | 3 | | 6 | 7 | 2 |
| Rhizocarpon geographicum | 3 | 5 | 7 | 3 | 1 |
| Selaginella "rupestris" (i.e. densa) | 1 | 1 | 5 | 13 | 9 |
| Buellia papillata | | 1 | 4 | 1 | 1 |
| Cetraria cucullata | | 3 | 6 | 11 | 17 |
| Cornicularia aculeata | | 1 | 2 | 3 | 3 |
| Peltigera canina | | 1 | 1 | 3 | 3 |
| Alectoria minuscula | | | 3 | 1 | 1 |
| Lecanora rupicola | | | 2 | 1 | 1 |
| Thamnolia subuliformis | | | 2 | 1 | 1 |
| Ochrolechia upsaliensis | | | 2 | 1 | 2 |
| Carex nardina | | | 7 | 14 | 28 |
| Festuca brachyphylla | | | | | 2 |
| Saxifraga bronchialis | | | | | 3 |
| % bare ground | 16.4 ±3.87 | 25.2 ±1.85 | 8.4 ±0.74 | 6.8 ±1.62 | 6.0 ±1.90 |

This fellfield vegetation has rightly been considered deserving of protection as a special feature of Plateau Mountain. Similar vegetation has not been described from elsewhere in Alberta. If other areas exist, they must be of lesser extent since level ground at an appropriate elevation is rare. The fact that this plateau was unglaciated makes its vegetation of special biogeographical interest.

3.6. Moist hummocky tundra (Tm) (stand no. 7)

Moist hummocky patterned ground at 7300-7800 feet to the West of the plateau supports a distinctive plant community heavily dominated by the sod-forming Carex gynnoclada. This community has not been described in the literature, and so should be ranked among the special features of the Plateau Mountain Reserve. Other herbs with significant coverage in the stand sampled were: Potentilla diversifolia, Deschampsia caespitosa, Allium schoenoprasum, Solidago multiradiata, Achillea millefolium, Poa alpina, Carex microptera, Gentiana prostrata, Stellaria monantha, Senecio lugens, Myosotis alpestris, Polygonum viviparum, Cerastium arvense, Rumex alpestris, Pedicularis groenlandica and Smelowskia calycina. The only prominent shrub is Salix glauca, which is scattered rather uniformly throughout the stand. These plants all grow among the homogenous and apparently stable Carex sod which covers most of the ground. Stones are exposed by cryoturbation only to a minor extent at the bottom of hollows. Epipetric lichens and a few low-growing herbs, such as Festuca brachyphylla and Sibbaldia procumbens, are confined to these hollows.

The moist condition of this site may be due to seepage and impeded drainage rather than winter snow accumulation. In the absence of data on snow accumulation it would be unwarranted to classify the vegetation as a form of chionophilic tundra. The condition of many plant species when recorded in July does not suggest a significantly shorter growing season than in neighbouring dry tundra communities. Many of the species also occur in herb-willow carr, which occupies moist seepage slopes not subject to cryoturbation, but the community is not identical. In particular, Gentiana prostrata is lacking in herb-willow carr, while several species characteristic of that community (such as Potentilla fruticosa, Aster foliaceus and Thalictrum occidentale) are lacking in moist hummocky tundra.

3.7. Alpine heath (Te) (stand no. 22)

Alpine heath is best developed in the reserve to the West of the plateau, on gently to strongly sloping ground above the area of moist hummocky tundra. The undisputed dominant is Phyllodoce glanduliflora. Other species with significant (above 1%) coverage in

the stand sampled were: Salix nivalis, Antennaria lanata, Erigeron peregrinus, Solidago multiradiata, Selaginella densa, Potentilla diversifolia, Erigeron aureus, Poa rupicola, Poa pattersonii, Festuca scabrella and Carex gymnoclada.

Heath dominated by Phyllodoce glanduliflora is reported to cover large expanses of undulating to rolling topography above treeline in Jasper and Banff National Parks (Achuff & Corns 1982). However, their list of other characteristic species is quite different from those present in Plateau Mountain stands except for the presence of Antennaria lanata. In particular, their codominant Cassiope mertensiana has not been recorded at all in the Plateau Mountain Reserve. The Phyllodoce association in Highwood Pass described by Trottier (1972) also appears different from that on Plateau Mountain, containing Vaccinium scoparium as subdominant. Clearly more than one alpine heath association dominated by Phyllodoce glanduliflora has to be recognized in the Alberta Rockies.

The Plateau Mountain stand is most similar to a stand in Kananaskis Provincial Park documented by Kondla (1978, stand 137-31d). The same three species show high coverage (over 5%) in both stands: Phyllodoce glanduliflora, Antennaria lanata and Salix nivalis. The species represented with lower coverage are mostly different (except for Sibbaldia procumbens and Castilleja occidentalis), but whether this is significant seems doubtful. Most probably a phytosociological association formed by the above three characteristic species can be recognized in SW Alberta. Phyllodoce-dominated vegetation was not reported as forming mappable stands in the Beehive Candidate Ecological Reserve (Griffiths 1981) nor in Waterton Lakes National Park (Kuchar 1973).

Heath dominated by Cassiope does not form mappable units in the Plateau Mountain Reserve, although patches of Cassiope tetragona occur in moist areas on slopes along the West side of the plateau (E31-14-4 at 7500-7900 feet).

### 3.8. Dryas tundra (Td) (stands nos. 8 & 17)

It was indicated in the Beehive report (Griffiths 1981) that the Dryas tundra of that reserve did not appear identical with that described for other parts of the Alberta Rockies, but that a

comprehensive treatment of Dryas communities in Alberta was lacking. Two stands of Dryas tundra were sampled in the Plateau Mountain Reserve. Quadrat no. 8 was located at a typical site on a dry saprolite ridge. The botanical composition is very similar to that of the similarly located Beehive stand 12 and the two stands must certainly be representative of the same phytosociological association. Comparison of the two quadrats suggests that the following species in common may be characteristic of this association: Dryas octopetala ssp. hookeriana (dominant), Oxytropis podocarpa, Oxytropis cusickii, Smelowskia calycina, Arnica alpina ssp. tomentosa, Hedysarum sulphurescens, Polygonum viviparum, Androsace chamaejasme, Potentilla diversifolia, Bromus pumpellianus, Myosotis alpestris, Zygadenus elegans and Aster alpinus. All species with over 5% coverage in either quadrat are also represented in the other. Oxytropis podocarpa is the most prominent herb in the Plateau Mountain stand.

Quadrat no. 17 represents an unusual stand located on limestone pavement below treeline. It shows some admixture of species found in juniper-bearberry scrub (Sw) in the vicinity, such as Juniperus communis, Koeleria cristata, Festuca scabrella and Anemone patens. Oxytropis podocarpa and Aster alpinus are lacking, but all other possibly characteristic species listed above are present. This stand is probably to be classified as a variant of the same association.

3.9. Talus tundra (Tt) (stands nos. 6 & 15)

Included in this mapping category are areas of stabilized talus scree (very strongly to extremely sloping) which are largely or entirely clothed with herbaceous vegetation. These areas are extensive at elevations between 7000 and 7900 feet on all faces of Plateau Mountain. Probably more than one phytosociological association occurs in these areas (dependent on moisture conditions and other factors), but without an extensive special survey it would not be reliable to subdivide this vegetation for mapping purposes. The boundaries between this talus tundra and talus barren (on unstable talus slopes) is best determined with ground photographs.

Quadrat no. 15 represents a typical stand of mesic talus tundra.

It has a fairly high coverage of Dryas octopetala ssp. hookeriana, but lacks some of the characteristic species of typical Dryas tundra (notably Oxytropis podocarpa, O. cusickii and Arnica alpina). The high coverage of Hedysarum sulphurescens appears characteristic of most areas of talus tundra which could be observed at close range. Other species with significant (over 1%) coverage in this quadrat were: Achillea millefolium, Agropyron latiglume, Potentilla fruticosa, Myosotis alpestris, Festuca scabrella, Bromus pumpellianus, Poa rupicola, Poa pattersonii, Potentilla diversifolia, Penstemon procerus, Fragaria virginiana, Cerastium arvense, Galium boreale, Polemonium pulcherrimum, Androsace chamaejasme, Gentiana amarella, Solidago multiradiata, Senecio lugens, Poa alpina, Poa interior and Anemone multifida. Which of these can be recognized as characteristic species of a phytosociological association cannot be determined without more data.

Quadrat no. 6 represents a moister stand on a seepage slope. Dryas is lacking and Hedysarum only a minor constituent. The large sedges Carex albonigra and C. atrosquama and wild chives (Allium schoenoprasum), all lacking or rare in quadrat 15, have high coverage. The common elements with significant coverage in both quadrats are Festuca scabrella, Potentilla fruticosa, Myosotis alpestris, Galium boreale, Achillea millefolium, Bromus pumpellianus, Potentilla diversifolia, Fragaria virginiana, Cerastium arvense, Polemonium pulcherrimum, Solidago multiradiata, Senecio lugens and Poa interior.

Comparison of the talus tundra of Plateau Mountain with that of other parts of the Alberta Rockies is only possible to a limited extent because of lack of data. Most authors have paid little or no attention to this vegetation. In the Beehive report (Griffiths 1981) an association called upper subalpine grassland is described from talus slopes of the main continental divide. This has a high coverage of Hedysarum sulphurescens and Potentilla fruticosa in common with the talus tundra of Plateau Mountain, but the other dominants and most of the herbs significantly represented are different. In view of the much higher precipitation along the continental divide, it is not surprising that the vegetation on talus slopes there is different. Talus tundra similar to that on Plateau Mountain probably occurs

elsewhere in the Highwood-Livingstone Range, although it was not reported in the studies of Kananaskis Provincial Park (Trottier 1972, Kondla 1978).

3.10. Kobresia tundra (Tk) (stand no. 12)

Tundra dominated by Kobresia myosuroides forms a distinctive vegetation type on level to gently sloping hummocky moraines in Sentinel Pass and in the cirques South of this pass along the East and South-East faces of Plateau Mountain. This tundra lies at elevations of 7000-7400 feet, often below the treeline on surrounding slopes. Over most of the area Kobresia is the undisputed dominant, with Dryas insignificant or absent. Other species with high (over 5%) coverage in the stand sampled were Bromus pumpellianus, Hedysarum sulphurescens and Selaginella densa.

According to Achuff & Corns' (1982) data, Kobresia myosuroides occurs in Jasper and Banff National Parks as a codominant with Dryas octopetala on south-facing slopes (their types H4 and H17). Only in the Highwood Pass has a community with Kobresia myosuroides as sole dominant deen described by Trottier (1972). His five stands were found at higher elevation (7690-8500 feet) on slopes and ridge crests. The "false alpine" tundra on valley floors in the Highwood Pass area is not Kobresia tundra. But despite the site difference the composition of Trottier's stands agrees substantially with that of the Plateau Mountain stand. Of the twelve species of vascular plants regularly occurring (in all five stands) in the Highwood Pass area, nine are also present in the Plateau Mountain stand (all except Arnica alpina, Potentilla nivea and Silene acaulis). Of the four species represented with high coverage in the Plateau Mountain stand, all are represented in some or all of the Highwood Pass stands. Therefore, it seems likely that the Plateau Mountain and Highwood Pass stands represent the same phytosociological association and that the different site specificity of this association in the two areas is due to climatic differences (higher precipitation in the Highwood Pass). The probable characteristic species of this association among the vascular plants are: Kobresia myosuroides (dominant), Bromus pumpellianus, Poa alpina, Selaginella densa, Androsace chamaejasme, Polygonum viviparum, Potentilla diversifolia and Myosotis alpestris. The mosses Hypnum

revolutum and Tortula ruralis are also characteristic (present in all stands), and there are probably characteristic lichens in the genera Cetraria and Cladonia.

3.11. Riverine fescue grassland (Gr) (stand no. 18)

The term riverine fescue grassland was introduced in the Beehive report (Griffiths 1981) for a stand on the floodplain of the Oldman River dominated by Festuca scabrella, Geum triflorum and Danthonia intermedia. Other species with significant coverage in that stand were: Agropyron trachycaulum, Potentilla gracilis, Penstemon confertus, Carex praticola, Koeleria cristata, Festuca saximontana, Penstemon procerus and Potentilla fruticosa. The stand could not be included in any described phytosociological association, although at a higher systematic level clearly falling within Looman's (1969) concept of an alliance Festucion scabrellae.

Confirmation that the Oldman River stand is representative of a distinct association is provided by the local occurrence of similar vegetation on benches along (seasonally dry) creeks in the headwaters of the Livingstone River. These stands within the Plateau Mountain Reserve are of more limited extent and more heterogenous than the Oldman River stand (hence with a much longer list of herb species), and show less pronounced dominance. Only Koeleria cristata and Festuca saximontana of the species listed above were not recorded. Species with high (above 5%) coverage in the Plateau Mountain stand but not recorded in the Oldman River stand are Carex microptera and Aster foliaceus.

Thus, comparison of the data for the Beehive and Plateau Mountain reserves suggests that the characteristic species of riverine fescue grassland are: Festuca scabrella (dominant or codominant), Geum triflorum, Danthonia intermedia, Agropyron trachycaulum, Potentilla gracilis, Potentilla fruticosa, Penstemon confertus, P. procerus and Carex praticola.

This grassland develops on floodplain benches which become subxeric in late summer, although no doubt moist early in the season. Carr vegetation develops on floodplain land which remains mesic or moist throughout the season.

3.12. Herb-willow carr (Ma) (stands nos. 4 & 9)

The term herb-willow carr is here introduced for a vegetational type well developed in the valley of Larch Creek, both along the creek and on seepage slopes. This presents itself as a mosaic of willow bushes, mostly Salix glauca but with an admixture of S. barrattiana at higher elevation, interspersed with purely herbaceous areas. Two stands were sampled. The lower (no. 4) lacks Salix barrattiana, the species with high (above 5%) coverage being Salix glauca, Deschampsia caespitosa, Epilobium angustifolium, Bromus pumpellianus, Aster foliaceus and Allium schoenoprasum. The higher stand (no. 9) has an equal proportion of Salix glauca and S. barrattiana, the other species with high coverage being Carex gymnoclada, Thalictrum occidentale, Aster foliaceus, Erigeron peregrinus and Allium schoenoprasum. Comparison of the data suggests the following tentative list of characteristic species for this community: Salix glauca, Potentilla fruticosa. Aster foliaceus, Allium schoenoprasum, Deschampsia caespitosa, Bromus pumpellianus, Epilobium angustifolium, Thalictrum occidentale, Agoseris glauca, Myosotis alpestris, Achillea millefolium, Phleum commutatum. Rumex alpestris, Potentilla diversifolia, Astragalus robbinsii and Poa grayana.

A comprehensive account of carr vegetation in the Alberta Rockies is not available. Evidently there is much variation in these communities according to site and climate, and many different phytosociological associations will need to be recognized. The herb-willow carr of the Plateau Mountain Reserve cannot be identified with any association previously described. It is impossible to judge whether it is a rare or common community without further data.

3.13. Shrubby cinquefoil carr (Mp) (stand no. 19)

Shrubby cinquefoil carr was first recognized as a distinct plant community in the Beehive report (Griffiths 1981). Data for the Plateau Mountain Reserve confirm that this is correct. An extensive carr agreeing with the description given in the Beehive report is found along the Upper Livingstone Valley. As in the Beehive Reserve, the shrub layer is composed of Potentilla fruticosa, Salix glauca and Betula glandulosa, the first being dominant. The

composition of the herb layer also agrees closely. The four species with high (over 5%) coverage in the Livingstone Valley stand, Poa pratensis, Fragaria virginiana, Aster foliaceus and Danthonia intermedia, all being similarly prominent in the stand on the Oldman River floodplain documented in the Beehive report.

Comparison of the data for the Beehive and Plateau Mountain Reserves suggests the following list of species as characteristic of shrubby cinquefoil carr: Potentilla fruticosa (dominant), Salix glauca, Betula glandulosa, Agropyron trachycaulum, Danthonia intermedia, Poa pratensis, Fragaria virginiana, Aster foliaceus, Achillea millefolium, Penstemon confertus, Gentiana amarella, Solidago multiradiata, Valeriana dioica and Potentilla gracilis.

The shrubby cinquefoil carr in the Upper Livingstone Valley is the only part of the reserve regularly grazed by cattle, something which no doubt tends to maintain the dominance of the relatively unpalatable Potentilla fruticosa.

3.14. Willow - dwarf birch carr (Ms) (stand no. 23)

Willow - dwarf birch carr was recognized as a very widespread community on floodplains and seepage slopes in the Beehive Reserve (Griffiths 1981), the codominant shrubs being Salix glauca, S. farrae and Betula glandulosa with lesser admixture of Potentilla fruticosa. In the Plateau Mountain Reserve this community was found only along Salter Creek, where a stand with the typical shrub composition was sampled at 6050 feet. There are however considerable differences in the herb layer between the Salter Creek and Beehive stands. Of the long lists of herbs recorded, only three species, Aster foliaceus, Fragaria virginiana and Valeriana dioica, are common in both areas. This difference is no doubt due to drier summer soil conditions in Salter Creek (which dries up). The herb layer of the Salter Creek stand is heavily dominated by Elymus innovatus, with high (over 5%) coverage also shown by Astragalus americanus, Fragaria virginiana and Festuca idahoensis. In the Beehive Reserve Elymus does not occur in this community and Festuca idahoensis is rare. Additional data is needed to determine whether the Beehive and Salter Creek stands represent vegetation which should be grouped at the association level or only at some higher systematic level.

3.15. Hairgrass community (Md)

Mud exposed by receding water levels in the cirque lake in NE5-15-4 (elevation 7100 feet) supports a vegetation consisting largely of tussocks of Deschampsia caespitosa. The only other vascular plants noted are colonies of Rorippa with prostrate growth habit. The identity of the species has not been clarified in time for the completion of this report. Possibly this is a rare species. Even if it proves only a variant of some widespread species, such as R. islandica (Oeder) Borb., the occurrence is still of scientific interest since there are no previous records of Rorippa growing at such a high elevation in the Alberta Rockies.

The presence of this Rorippa, combined with the scarcity of high altitude lakes in the Highwood-Livingstone range, suggests that the cirque lake and its biotic communities should be regarded as a special feature of the Plateau Mountain Reserve.

3.16. Krummholz (Sk)

Krummholz (coniferous growth stunted by exposure to wind or avalanches) occurs only as small patches or strips intermixed with tundra in the Plateau Mountain Reserve, rarely forming mappable units. No quadrat data was collected. An East-facing strip of dry krummholz below the North end of the plateau (at 7400 feet) proved on examination to consist of Abies lasiocarpa, Picea engelmannii, Salix vestita and S. glauca. There were no herbs beneath the dense shrubs. Gaps between the shrubs were occupied by Dryas tundra.

Whitebark pine (Pinus albicaulis) can also occur as krummholz.

One avalanche slope supporting krummholz has been mapped in NE17-15-4. No other avalanche slopes were observed in the reserve.

3.17. Subalpine juniper-bearberry scrub (Sw) (stand nos. 14 & 16)

Scrub communities dominated by Juniperus communis, J. horizontalis and Arctostaphylos uva-ursi are common on dry sunny slopes in the subalpine and montane zones of SW Alberta, but have never been

critically studied from a phytosociological standpoint. Stands of these communities may be completely treeless, or include isolated trees (especially pines). As in the Beehive report (Griffiths 1981), I have provisionally distinguished subalpine from montane scrub, although this distinction may eventually prove too simplistic.

Both stands of subalpine scrub sampled in the Plateau Mountain Reserve are dominated by prostrate mats of Arctostaphylos uva-ursi ssp. stipitata with the two juniper species both abundant but with lower coverage. Isolated saplings of Pinus albicaulis, P. contorta and Picea engelmannii occur. Herbs which appear characteristic of this community (well represented in both quadrats) are: Hedysarum sulphurescens, Elymus innovatus, Festuca scabrella, Calamagrostis purpurascens, Zygadenus elegans, Linum lewisii, Galium boreale, Allium cernuum, Aster alpinus, Anemone multifida and Gentiana propinqua.

This vegetation shows differences in composition from the subalpine scrub described in the Beehive report (Griffiths 1981) (as whitebark pine - juniper scrub), which occupies unstable erosional slopes and includes pioneering plants lacking in the Plateau Mountain stands (such as Erigeron compositus and Astragalus bourgovii). Stable well-drained slopes in the subalpine zone of the Beehive Reserve are normally forested due to the ample precipitation. The occurrence of scrub vegetation on stabilized sunny slopes in the subalpine zone is a feature of mountains in the rainshadow of the continental divide.

3.18. Montane aspen-juniper-bearberry scrub (Sm) (stand no. 1)

Montane scrub is found only peripherally in the Plateau Mountain Reserve on sunny slopes at lower elevation. The stand sampled near the NW corner of the reserve is very similar in composition to Beehive stand no. 23 (Griffiths 1981), and will surely be grouped with it in any phytosociological analysis. This montane community differs from subalpine juniper-bearberry scrub in the presence of stunted aspen with significant coverage, as well as in details of the herb composition. Such species as Aster laevis, Koeleria cristata, Gaillardia aristata and Vicia americana are rare or lacking in

subalpine juniper-bearberry scrub.

The most significant difference between the Plateau Mountain stand and Beehive stand 23 lies in the high coverage of the grasses Elymus innovatus and Bromus pumpellianus, neither recorded in the Beehive stand. All other species with high (above 5%) coverage in either stand are also common in the other. Comparison of the data for these two stands suggests the following as possible characteristic species of a phytosociological association: Arctostaphylos uva-ursi (dominant), Juniperus horizontalis, Populus tremuloides, Potentilla fruticosa, Juniperus communis, Aster laevis, Solidago multiradiata, Koeleria cristata, Achillea millefolium, Poa interior, Hedysarum sulphurescens, Antennaria rosea, Galium boreale, Vicia americana and Campanula rotundifolia. However, stands of montane scrub with quite different herb composition also occur in SW Alberta (as Beehive stand no. 3) and it is impossible to determine how wide or narrow a concept of plant association should be applied in the absence of any comprehensive study of scrub vegetation.

3.19. Seral subalpine scrub (Ss) (stand no. 10)

This mapping category is applied to old burns on formerly forested sunny talus slopes, where recolonization by tree saplings is sparse. Succession to closed forest must take several centuries on these sites. The stand sampled (quadrat no. 10) burned at least 50 years ago (according to the age of one of the largest trees), but still has less than 5% total coverage of trees and tree saplings. The ground layer is dominated by Arctostaphylos uva-ursi, with herb composition in many respects similar to that of subalpine juniper-bearberry scrub. Differences lie in the significant coverage of Salix glauca, Fragaria virginiana, Penstemon confertus and Arnica cordifolia, while the two juniper species are scarce and Calamagrostis purpurascens, Linum lewisii, Aster alpinus and Gentiana propinqua lacking. These differences indicate less xeric soil conditions. Probably all plant species represented on these burns are derived from neighbouring forest, scrub and tundra communities, and none are uniquely characteristic of burns. The only species not recorded in any other community was Astragalus eucosmus, but that is probably fortuitous. No comparison can be made between this successional

vegetation and successional vegetation in other parts of the Alberta Rockies because of lack of sufficiently detailed published information.

3.20. Gravel bar scrub (Sg) (stand no. 25)

Communities dominated by Dryas drummondii occupying calcareous alluvium along rivers and streams in the montane and subalpine zones have been recognized in previous studies. Kuchar (1973) referred to the presence of Dryas drummondii on alluvial gravel in Waterton Lakes National Park, but gave no data on associated species. Kondla (1978) refers to a monoculture of Dryas drummondii on the King Creek Fan in Kananaskis Provincial Park. Achuff & Corns (1982) in their classification of Jasper/Banff vegetation recognize a Dryas drummondii - Epilobium latifolium community (H8).

Whether one or more plant associations dominated by Dryas drummondii should be recognized in the Alberta Rockies is uncertain in the absence of any comprehensive study. Epilobium latifolium is uncommon in the Plateau Mountain Reserve and scarcely qualifies as a characteristic species. A more regular associate of Dryas drummondii along Salter Creek is the shrub Salix drummondiana, and it is possible that this should be recognized as a characteristic species of an association dominated by Dryas. Most of this gravel bar scrub is being colonized by tree saplings (mainly Picea glauca/engelmannii and Populus trichocarpa) and succession to riverine forest would occur in the absence of disturbance. Presumably the trees are destroyed periodically by flooding and gravel movement. Areas of bare gravel between Dryas patches provide a seedbed for herbs occurring on neighbouring talus slopes (Bt, Tt), as indicated by the list of herbs in the quadrat. None of these herb species are confined to gravel bars, and to what extent they can be considered characteristic of this habitat is uncertain without more data.

3.21. Upper subalpine spruce-fir-larch forest (Fu) (stand no. 5)

Alpine larch is confined in the Plateau Mountain Reserve to the valley of Larch Creek, where it is especially prominent in the saddle where the creek rises. Here this tree is at the eastern limit of its range, growing in mixed stands with Picea engelmannii and Abies lasiocarpa. Not a single larch tree was seen in the Upper Livingstone Valley.

The understory of the forest along Larch Creek is dominated by Vaccinium scoparium and Phyllodoce glanduliflora, the only herbs with significant (above 1%) coverage being Antennaria lanata and Erigeron peregrinus. Stands with similar composition are recorded for Kananaskis Provincial Park by Kondla (1978). Comparison with his data suggests that there is a phytosociological association characterized by Larix lyallii, Picea engelmannii, Abies lasiocarpa, Phyllodoce glanduliflora, Vaccinium scoparium, Antennaria lanata and Erigeron peregrinus distributed East of the continental divide in Alberta.

Forests in which alpine larch occurs in the Beehive Reserve (Griffiths 1981) and Waterton Lakes National Park (Kuchar 1973) are of very different composition. The fir-larch forests of Banff National Park also appear different in composition: Achuff & Corns (1982) list two types (C23 and 013), of which only the krummholz type 013 contains Phyllodoce glanduliflora. The Plateau Mountain stand cannot be identified with 013, since it is not krummholz and lacks many of the characteristic species listed.

Arno & Habeck (1972) in their monograph on the ecology of alpine larch state that "Phyllodoce glanduliflora is often a major species in alpine larch stands in northwestern Montana and along the Continental Divide ranges", while Vaccinium scoparium "is a major dominant occupying a broader spectrum of alpine larch habitats than any other species". Unfortunately they do not present any details of stands containing Phyllodoce, by which this vegetation can be compared with the association occurring in Alberta.

Poor stony soil is a frequent characteristic of alpine larch sites, and the stand on Larch Creek is no exception. There has been disagreement over whether alpine larch develops on calcium-rich sites. Arno & Habeck claim that it is normally absent from limerich substrates. The valley of Larch Creek runs along the McConnell thrust sheet where there is a complex outcropping of calcium-rich and calcium-poor strata. Whether the restriction of alpine larch to this valley is due to lower calcium status or to higher precipitation on the West side of Plateau Mountain remains to be determined.

3.22. Upper subalpine spruce-fir-whitebark pine forest (Fw) (stand no. 13)

Included here is closed or open upper subalpine forest with high coverage (over 5%) of whitebark pine (Pinus albicaulis), in addition to Picea engelmannii and Abies lasiocarpa. This forest is especially widespread in the Upper Livingstone Valley, where it has an elevational range of about 6750 to 7500 feet. At its lower elevational range lodgepole pine (Pinus contorta) becomes frequent, and there is a gradual transition to spruce-fir forest (Fo) with varying admixture of lodgepole pine. Above 7000 feet lodgepole pine is generally lacking. In some areas the treeline is not well marked and park-like stands transitional to tundra occur. The composition of this forest is believed to be stable, since whitebark pine continues to reproduce. The stand sampled contained trees up to 285 years old. The great age of this forest and its high coverage of whitebark pine, a species rarely forming extensive forest stands in Alberta, mark it as a special feature of the Plateau Mountain Reserve.

More than one understory type may be recognized in this forest, but it would not be reliable to attempt to map them separately without more extensive ground checking. The stand sampled is representative of mesic conditions in partly open forest. Highest coverage in the understory is shown by Vaccinium myrtillus, Erigeron peregrinus and Valeriana sitchensis, with significant (above 1%) coverage also shown by Arnica latifolia, Elymus innovatus, Solidago multiradiata, Fragaria virginiana, Trisetum spicatum, Pedicularis bracteosa, Arnica cordifolia, Aquilegia flavescens, Senecio lugens and Aster foliaceus. On drier slopes at lower elevation an understory dominated by Shepherdia canadensis and Linnaea borealis may develop, similar to that documented in quadrat 21 for lower subalpine lodgepole pine forest (Fl). This type was not sampled, and may be transitional to other forest types (Fo or Fl) rather than a distinct association.

The further distribution of spruce-fir-whitebark pine forest of the types represented in the Plateau Mountain Reserve is unknown. Forest containing whitebark pine occurs in Waterton (Kuchar 1973), where the understory is dominated by Xerophyllum tenax. In the Beehive Reserve along the continental divide (Griffiths 1981) whitebark pine

grows in a seral upper subalpine mixed forest which is replaced by a spruce-fir climax. In Jasper/Banff spruce-fir-whitebark pine forest has an understory dominated by Menziesia glabella and Vaccinium scoparium (Achuff & Corns 1982, type C12). No forest containing whitebark pine has been reported for Kananaskis Provincial Park by Kondla (1978). Accordingly, it appears that any wider distribution of the forest types containing whitebark pine in the Plateau Mountain Reserve must be outside the national and provincial parks. The inclusion of this forest within the candidate ecological reserve is thus sufficiently justified.

3.23. Subalpine spruce-fir forest (Fo) (stands nos. 2, 3 & 20)

This is the climax forest of the lower subalpine zone. The stands sampled all fall within an age range of 200-300 years according to core data. Stand no. 3 still retains old lodgepole pines, despite a stand age of at least 280 years. Since the pines are not even-aged and most are younger than the stand, a very slow process of seedling establishment after fire must be assumed to have occurred. The condition of stands of seral subalpine scrub (Ss) in the vicinity, with less than 5% coverage of tree species 50 years after fire, lends support to this explanation. For mapping purposes stands retaining an admixture of lodgepole pine have not been separated from stands now containing only Engelmann spruce and alpine fir, provided that spruce and fir have greater canopy coverage. Normally Engelmann spruce is the canopy dominant in the Plateau Mountain Reserve, and this appears to be the climax state. Although regeneration of alpine fir may be denser, this is compensated by the greater longevity of Engelmann spruce.

At least three understory types can be distinguished in this climax forest, but it would not be reliable to map them separately without an extensive ground survey. The most widespread type, associated with subxeric soil conditions, is identical with type C13 of Achuff & Corns' (1982) treatment of the vegetation of Jasper/Banff. They list the characteristic species as: Picea engelmannii, Abies lasiocarpa, Vaccinium scoparium, Pyrola secunda, Cornus canadensis, Linnaea borealis, Equisetum scirpoides, Arnica cordifolia, Moneses uniflora, Peltigera aphthosa, Pleurozium schreberi and Hylocomium

splendens. Quadrat no. 2 documents a stand of this type, containing all listed species. Kondla's (1978) spruce-fir/feathermoss and spruce-fir/grouseberry-feathermoss associations in Kananaskis Provincial Park also appear not significantly different. As stated by Achuff & Corns, this community is characterized by a closed canopy and nearly complete feathermoss cover, with sparse coverage and low diversity of understory herbs. Probably this is the most widespread type of climax forest in the subalpine zone of mountains in the rainshadow of the continental divide in Alberta.

Quadrat no. 3 documents a stand with a much more diverse herb complement due to moister soil conditions. High coverage in the understory is shown by Vaccinium myrtillus, V. scoparium, Arnica cordifolia, Angelica dawsonii, Valeriana sitchensis and Hedysarum sulphurescens. This composition approaches that of Beehive stand no. 15 (Griffiths 1981), situated on a similarly moist site.

Quadrat no. 20 documents a rather open north-facing stand with exceptionally diverse shrub and herb layers, including a prominent willow component (Salix vestita, S. glauca and S. barrattiana). The ground layer is dominated by Phyllodoce glanduliflora and Vaccinium myrtillus. No single herb species attains high coverage, but a diversity of species are significantly represented (with over 1% coverage), namely: Pyrola secunda, Carex concinnoides, Pedicularis bracteosa, Arnica latifolia, Pyrola minor, Anemone parviflora, Polygonum viviparum, Parnassia fimbriata, Erigeron peregrinus, Stenanthium occidentale, Luzula parviflora, Moneses uniflora and Valeriana sitchensis. The composition of this stand is quite different from any previously described. Whether it is unique or representative of a more widely occurring association is unknown. One of the species represented, Pyrola minor, was seen nowhere else in the Plateau Mountain Reserve.

3.24. Lower subalpine lodgepole pine forest (Fl) (stand no. 21)

Lodgepole pine forest (dominated by Pinus contorta var. latifolia) represents an intermediate stage in succession to spruce-fir forest (Fo) in the Plateau Mountain Reserve. However, the process of succession is very slow. In the stand sampled in the Upper Livingstone Valley spruce and fir seedlings are still sparse after over 100 years

since the last fire. The dominant understory species are Shepherdia canadensis and Linnaea borealis, with high coverage also shown by Arnica cordifolia, Pyrola secunda, Elymus innovatus and Carex concinnoides. Probably this forest type can be grouped at association level with Achuff & Corns' (1982) type C19, which is found on south-facing slopes in Jasper and Banff National Parks. Achuff & Corns list the characteristic species as: Pinus contorta, Picea glauca x engelmannii, Shepherdia canadensis, Linnaea borealis, Elymus innovatus, Carex concinna, Pyrola secunda, Goodyera repens and Pleurozium schreberi. In the Plateau Mountain Reserve the dominants are the same, but Carex concinnoides replaces C. concinna and Goodyera is lacking. Kondla's (1978) data indicate that Goodyera is also not characteristic in Kananaskis Provincial Park. Among the fourteen types of lodgepole pine forest recognized by Kondla, five contain Shepherdia canadensis, Linnaea borealis, Elymus innovatus, Arnica cordifolia and Pyrola secunda in combination. I doubt whether all Kondla's units can represent distinct phytosociological associations with their own diagnostic species (Kensorts). Probably an association corresponding to Achuff & Corns' type C19 can be recognized as widespread in the lower subalpine zone of mountains in the rainshadow of the continental divide in Alberta. Other types of lodgepole pine forest were not noted in the Plateau Mountain Reserve, where this seral forest covers more limited areas than climax spruce-fir forest (Fo).

3.25. Riverine forest (Fr)

Riverine forest was recognized as a separate community in the Beehive report (Griffiths 1981) on account of the presence of white spruce (Picea glauca) and Picea glauca/engelmannii intergrades as well as understory differences. In the Plateau Mountain Reserve white spruce was observed only along the floodplain of Salter Creek, growing together with Engelmann spruce and intergrades. Accordingly a narrow band of spruce-dominated forest (with varying admixture of lodgepole pine) along this creek has been mapped as riverine forest. The understory in the few patches where uniform stands are developed is similar to that of the lodgepole pine forest discussed above (Fl), with Shepherdia and Linnaea prominent. No quadrat data was collected. Some of this forest intergrades with gravel bar scrub (Sg).

3.26. Mixed pine open forest (Fp) (stand no. 24)

Included in this category is climax forest composed of the three pine species, Pinus flexilis, P. albicaulis and P. contorta var. latifolia, or of the first two alone. The discovery of this previously unreported community is the most surprising result of the present survey. Limber pine (Pinus flexilis) rarely grows in forest stands in Alberta. In Jasper/Banff Achuff & Corns (1982) have reported only one infrequent open forest type (02) containing limber pine. This is found on steep south-facing erosional slopes between 1350 and 1800 metres (4430-5900 feet). The characteristic species are listed as: Pinus flexilis. Picea glauca, Juniperus communis, J. horizontalis, J. scopulorum. Potentilla fruticosa, Arctostaphylos uva-ursi, Aster sibiricus, Senecio canus and Festuca scabrella.The stands within the Plateau Mountain Reserve containing limber pine cannot be referred to the above community. They are different in composition and occupy a higher elevational range (6100-6800 feet).

Mixed pine open forest is found only on the south-facing slopes of Mount Burke in the Salter Pass, where the stands are traversed by the existing boundary of the Plateau Mountain Reserve. The quadrat data refers to a stand on a less extreme site with modest soil development, where lodgepole pines are more numerous than pines of the other two species. There is a well developed shrub layer containing Potentilla fruticosa, Shepherdia canadensis and Populus tremuloides with high coverage. The most numerous herb is Elymus innovatus. The normal scrub dominants, Arctostaphylos uva-ursi, Juniperus communis and J. horizontalis, have significant coverage but are not dominant. Other herbs with significant (over 1%) coverage are: Aster sibiricus, Solidago decumbens, Gaillardia aristata, Agoseris glauca, Galium boreale, Hedysarum sulphurescens, Anemone multifida, Senecio canus, Aster foliaceus, Allium cernuum, Androsace chamaejasme and Calamagrostis purpurascens. On steeper slopes and rock outcrops with little or no soil development limber and whitebark pine predominate and the shrub and herb layers are depauperate. Limber pine reaches a height of at least 15 m and diameter of at least 40 cm in these stands. The age of the largest tree in our quadrat was estimated at 420 years.

The significance of this discovery may be explained in a biogeographic context. Limber pine is distributed mainly in the Western United States, occurring in Canada only in Alberta and extreme SE British Columbia. In most of its range it grows at high elevations as a timberline species, behaving in much the same way that whitebark pine does in the Canadian Rockies. But in Canada limber pine is usually found below the lower limit of forest forming scrub on ridges in the foothills. For instance, Kuchar (1973) reports that in Waterton Lakes National Park this species generally does not grow more than 5 metres tall and forms scrub on bedrock exposures between 5000 and 6000 feet. Salter Pass is the first location in Alberta where limber pine has been reported growing as a tree in timberline forest, like it does in Montana and elsewhere in the United States. Therefore, the ancient pine forest in this pass has to be considered a special feature of high scientific interest. The present boundary of Plateau Mountain Candidate Ecological Reserve traverses this forest. We strongly recommend further survey work on the slopes of Mount Burke with a view to revising the boundary so that all of this unique forest is protected.

3.27. Disturbed ground (Dg)

Plateau Mountain Reserve lies within the Savanna Creek gas field and includes a great deal of ground disturbed by gasfield activity (wells, pipelines, access roads, borrow pits etc.). We did not sample the vegetation of ground disturbed by human agency. Much of this disturbance has exposed gravel, which provides a seedbed for plants growing on neighbouring talus slopes. For instance, the following species were noted as growing on disturbed gravel by a gas well on Dry Creek (NW30-14-4): Arctostaphylos uva-ursi, Dryas octopetala ssp. hookeriana, Ribes lacustre, Salix glauca, Potentilla fruticosa, Penstemon ellipticus, P. procerus, P. confertus, Phacelia sericea, Artemisia michauxiana, Cirsium hookerianum, Aster sibiricus, Erigeron debilis, Agoseris glauca, Astragalus vexilliflexus, Oxytropis splendens, O. deflexa, Polemonium pulcherrimum, Sedum lanceolatum, Taraxacum officinale, Gentiana amarella and Aquilegia flavescens.

3.28. Saxifrage-moss community

Vegetated areas occur at several places on cliffs around the plateau where there is water seepage. These areas have not been mapped, since they form linear features of too limited extent. The vegetation is dominated by mosses and includes two species of Saxifragaceae not noted in other communities. Only one moist cliff was examined at close range, at 7600 feet with NE aspect on the cirque wall in NE5-15-4. A collection of bryophytes was determined by Dr. D. G. Horton to contain the following species: Athalamia (= Clevea) hyalina, Bryum pseudotriquetrum, Philonotis fontana, Bryum weigelii, Plagiomnium ellipticum, Pohlia cruda, Brachythecium turgidum and Amblystegium serpens. The herbs growing among the mosses included several Saxifragaceae (Saxifraga adscendens, S. lyallii, S. bronchialis, Parnassia fimbriata and P. kotzebuei), Oxyria digyna, Polygonum viviparum, Cerastium arvense, Erigeron humilis, Epilobium latifolium and E. hornemannii. The only grass identified was Deschampsia caespitosa, the only shrub Salix nivalis. Comparative information on similar sites in other parts of the Alberta Rockies is not available.

# 4. DISCUSSION

## 4.1. Comparison of vegetation

Comparisons with the vegetation described for other areas of the Alberta Rocky Mountains have been made in the previous discussion of each vegetation type occurring within the Plateau Mountain Candidate Ecological Reserve. Comparative information has been available for Jasper and Banff National Parks (Achuff & Corns 1982), parts of Kananaskis Provincial Park (Trottier 1972, Kondla 1976), Beehive Candidate Ecological Reserve (Griffiths 1981) and Waterton Lakes National Park (Kuchar 1973). On the basis of this information it is possible to assess with some confidence whether particular vegetation types also occur in these other protected areas. But it is impossible in many cases to determine whether a vegetation type not reported in these other areas is unique to the Plateau Mountain Reserve or occurs more widely in the Highwood-Livingstone Range and elsewhere. With this caveat, the following summary of the wider distribution in Alberta and representativeness or uniqueness of the vegetational communities of the Plateau Mountain Reserve is offered:

1. Widespread communities:
   (i) Engelmann spruce - alpine fir forest with Vaccinium scoparium and dense feathermoss understory (Fo, in part) is probably the most widespread climax forest type in the subalpine zone of mountains in the rainshadow of the continental divide from Jasper Park to the Crowsnest;
   (ii) lodgepole pine forest with Shepherdia canadensis and Linnaea borealis understory (Fl) is the seral precursor of the preceding on south-facing slopes in the lower subalpine zone, and is similarly widely distributed.
2. Communities also occurring in Kananaskis Provincial Park:
   (i) alpine heath dominated by Phyllodoce glanduliflora with Antennaria lanata and Salix nivalis (Te);
   (ii) subalpine kobresia tundra dominated solely by Kobresia myosuroides (Tk);
   (iii) Engelmann spruce - alpine fir - alpine larch forest with Phyllodoce glanduliflora and Vaccinium scoparium understory (Fu).

3. Communities also occurring in Beehive Candidate Ecological Reserve
   (i) Dryas octopetala tundra with Oxytropis podocarpa, O. cusickii, Smelowskia calycina etc. (Td);
   (ii) riverine Festuca scabrella grassland with Geum triflorum and Danthonia intermedia (Gr);
   (iii) Potentilla fruticosa carr with Salix glauca and Betula glandulosa (Mp);
   (iv) Salix glauca - S. farrae - Betula glandulosa carr (Ms), but associated with different herb layers in the two reserves;
   (v) montane scrub dominated by Arctostaphylos uva-ursi, with Juniperus horizontalis, Populus tremuloides, Potentilla fruticosa, Juniperus communis, Aster laevis etc. (Sm);
   (vi) moist Engelmann spruce - alpine fir forest with Vaccinium myrtillus, Arnica cordifolia, Valeriana sitchensis etc. (Fo, in part).
4. Communities of unknown distribution, but assumed not to be highly localized:
   (i) talus tundra dominated by Hedysarum sulphurescens (Tt, in part);
   (ii) moist talus tundra with Carex albonigra, C. atrosquama, Allium schoenoprasum etc. (Tt, in part);
   (iii) herb-willow carr with Salix glauca, Potentilla fruticosa, Aster foliaceus, Allium schoenoprasum etc. (Ma);
   (iv) subalpine scrub dominated by Arctostaphylos uva-ursi, with Juniperus communis, J. horizontalis, Hedysarum sulphurescens, Elymus innovatus etc. (Sw);
   (v) seral subalpine scrub (Ss) with sparse tree saplings, dominated by Arctostaphylos uva-ursi (on old burns);
   (vi) Dryas drummondii - Salix drummondiana scrub (Sg);
   (vii) riverine forest with Picea glauca (Fr);
   (viii) saxifrage-moss community on moist cliffs.
5. Communities assumed to be rare or unique (not reported elsewhere):
   (i) talus barren community with Penstemon ellipticus, Artemisia michauxiana, Agropyron scribneri, Festuca baffinensis, Saussurea densa etc. (probably rare or unique in composition since Agropyron scribneri is on the rare plants list) (Bt);
   (ii) fellfield tundra on the summit of Plateau Mountain (since the patterned ground features have been assessed as the finest and most extensive examples of such features in Alberta, the associated vegetation must be similarly assessed) (Tf);

(iii) moist hummocky tundra dominated by Carex gymnoclada (Tm), also associated with patterned ground;

(iv) Deschampsia caespitosa - Rorippa sp. community (Md) on shore of lake in NE5-15-4 (probably rare or unique, since the Rorippa is a species whose identity requires clarification);

(v) Engelmann spruce - alpine fir - whitebark pine forest with Vaccinium myrtillus, Erigeron peregrinus and Valeriana sitchensis understory (Fw) (probably not unique, but certainly outstandingly represented in the Upper Livingstone Valley);

(vi) Engelmann spruce - alpine fir forest with mixed Salix layer (S. vestita, S. glauca and S. barrattiana) and ground layer dominated by Phyllodoce glanduliflora and Vaccinium myrtillus (Fo, in part) (possibly unique, known only from north-facing slope in NE33-14-4);

(vii) mixed pine open forest dominated by Pinus flexilis, P. albicaulis and P. contorta or by the first two species only (Fp) (unique and outstanding).

## 4.2. Rare plants

The most recent version of the list of rare vascular plants of Alberta (Packer & Bradley 1980) excludes many species included in earlier lists, so that only highly localized species remain. A well known rarity of Plateau Mountain which remains on the list is Agropyron scribneri, a member of the talus barren community which may have persisted here throughout the Pleistocene. Also possibly rare is the Rorippa growing on the shore of the cirque lake in NE5-15-4. The identity of this species requires clarification, as explained above (see section 3.15). There is no previous record of Rorippa growing at high elevation in the Alberta Rockies.

## 4.3. Zoological Resources

Only preliminary observations can be made, based on notes made incidentally to our botanical work. The complete faunal notes (prepared by Deirdre E. Griffiths) have been deposited with the Natural Areas Coordinator.*

Bighorn sheep are the most common ungulates in the Plateau Mountain Reserve. Probably over 100 animals are resident year-round on Plateau Mountain, which forms one of a series of sheep habitats

*These notes are attached as Appendix 3 to this report.

in the Highwood-Livingstone Range. Tracks suggest that the cirque lake in NE5-15-4 is an important watering place for sheep and care should be taken to ensure that it is not polluted by activity at at the gas well nearbye.

Elk and mule deer were sighted but appear uncommon. No bears or other large predators were observed.

Hoary marmots and pikas are common on rubbly talus screes around the plateau. Smaller rodents sighted include red squirrels, Columbian ground squirrels, golden-mantled ground squirrels, least chipmunks and buff-bellied chipmunks. The typical diggings of pocket gophers (Thomomys talpoides) were commonly observed on open ground with suitable soil conditions (up to 7700 feet in alpine heath in SE6-15-4). This is believed to be a new elevational record for Alberta. Recent observations in SW Alberta by Dr. J. Murie (verbal communication) had indicated their presence elsewhere only up to 6000 feet.

The following were noted as common breeding birds during 1982: grey jay, Clark's nutcracker, mountain chickadee, American robin, hermit thrush, water pipit, yellow-rumped (Audubon's) warbler, pine siskin, dark-eyed junco and white-crowned sparrow. Others less frequently observed were: spruce grouse, great-horned owl, common (red-shafted) flicker, western flycatcher, horned lark, American raven, boreal chickadee, red-breasted nuthatch, varied thrush, Townsend's solitaire, ruby-crowned kinglet, MacGillivary's warbler, grey-crowned rosy finch, red crossbill, Brewer's sparrow and fox sparrow. Raptors observed hunting were golden eagle (one subadult), marsh hawk (adult female and two immatures), red-tailed hawk (one adult) and American kestrel (adult female). Whether these nest inside the reserve is unknown. Bird (1979) also reports white-tailed ptarmigan on Plateau Mountain.

Butterflies and skippers have been studied on Plateau Mountain by several workers and a list of 40 species collected in the alpine area published by Bird (1975). Several of the species have very local distributions in high mountains, such as the Astarte and Alberta fritillaries (Boloria astarte and B. alberta).

The cirque lake at 7100 feet in NE5-15-4 provides a disjunct habitat for many aquatic alpine insects and crustacea, including mayflies, caddisflies. beetles, gerrids, corixids, notonectids, copepods and cladocerans. A large calinoid copepod from this lake has been identified as Diaptomus shoshone (det. Dr. P. Hurtaugh), characteristic of alpine ponds along the continental divide. One of the caddisflies has been determined as probably Asynarchus aldinus (Ross) (det. Dr. A. P. Nimmo) found in the same habitat. The rest of the fauna remains to be investigated.

4.4. Special features

This section attempts to summarize the special biophysical features of Plateau Mountain Candidate Ecological Reserve within its presently proposed boundaries. Archaeological features are excluded from consideration. since the author does not know the location of the sites and is not competent to assess their importance.

The special features of the plateau have been well known for some time. They include:

(i) the finest and most extensive example of strongly cryoturbated patterned ground (sorted stone stripes, nets and polygons) in Alberta, with its associated vegetation (fellfield tundra);

(ii) permafrost extending to a depth of possibly 100 metres or more below the plateau;

(iii) the ice cave in E17-15-4; and

(iv) biogeographical interest as an extensive refugium, since the plateau was never glaciated during the Pleistocene.

Special features of other parts of the Reserve identified during the present study are as follows:

(v) limestone pavement with well developed glacial striae at 7100 feet in NE4-15-4;

(vi) excellent examples of glacial cirques and hummocky cirque moraines along East and South-East faces of Plateau Mountain;

(vii) the small cirque lake at 7100 feet in NE5-15-4 providing a rare habitat for alpine aquatic insects in the Highwood-Livingstone Range, with an unidentified Koripps sp. growing on its shores;

(viii) an exceptionally diverse plant community on unstable talus screes, including the rare Agropyron scribneri, due to the continuous availability of this habitat throughout the Pleistocene;

(ix) a previously undescribed plant association dominated by Carex gymnoclada on moist hummocky patterned ground;

(x) a fine example of spruce-fir-larch forest with Phyllodoce glanduliflora and Vaccinium scoparium understory at the head of Larch Creek (very local forest type);

(xi) outstanding development of spruce-fir-whitebark pine forest in the Upper Livingstone Valley, with many trees aged 200-300 years;

(xii) a spruce-fir stand with previously unrecorded understory type of exceptional diversity on north-facing slope in NE33-14-4; and

(xiii) ancient limber pine (many over 400 years old) growing in unique and outstanding forest type with whitebark pine and lodgepole pine at 6100-6800 feet on the lower slopes of Mount Burke (well above the elevation previously reported for limber pine in Alberta).

## 4.5. Concluding remarks

While mountains are highly diverse in topography and vegetation and probably a few unique features could be identified on most mountains in Alberta, the above list of special features is impressive and fully justifies the protection of an enlarged Plateau Mountain Ecological Reserve, not merely of the alpine plateau. Further survey work on the slopes of Mount Burke before the reserve boundaries are finalized is strongly recommended, so that the unique pine forests of the area can be fully protected.

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(Only a draft of Tables 1 and 2 and Appendix B has been available in advance of publication during preparation of the present report).

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# APPENDIX 1

## STAND DESCRIPTIONS FOR 25 SAMPLE STANDS

PLATEAU MOUNTAIN SURVEY

# STAND DESCRIPTION

Vegetation Type: Montane aspen-juniper-bunchgrass scrub  Sample No.: 1  Location: above Plateau Creek NE24-15-5-W5  Date: 21st July 1982
Elevation: 5700 ft.  Slope: 60-70%  Aspect: W  Quadrat Sizes: 15m for tall/low shrubs, 10m for others
Landform & Topography: Stable slope above creek, rolling, with occasional exposures of bedrock and saprolitic blocks and rubble

Drainage Class: rapid  Hygrotope: xeric
Soil: Orthic Eutric Brunisol (Ah 0-1cm, ± 20cm light brown Bm over rubble)
Ground cover other than vegetation (e.g. rocks, water, deadfall, bare soil)
Exposed bedrock and saprolitic rubble C1  Deadfalls +
Successional status (early/ intermediate/ advanced/ (mature))
TREES > 5m (cover, number, dbh, height, age if cored, regeneration)

NONE

TALL SHRUBS 2-5m (cover, abundance, phenology)
Populus tremuloides C1 A4 in full leaf, new shoot growth up to 7 cm

LOW SHRUBS 0.5-2m (cover, abundance, phenology)
Populus tremuloides C2 A6 (phenology as above)

DWARF SHRUBS < 0.5m (cover, abundance, phenology)

| | | |
|---|---|---|
| Arctostaphylos uva-ursi ssp. stipitata | C3 mats | with young fruit, new shoot growth up to 3 cm |
| Juniperus horizontalis | C2 mats | new shoot growth 1-2 cm |
| Potentilla fruticosa | C2 A5(bushes) | at peak of flowering |
| Populus tremuloides | C1 A7 | (phenology as above) |
| Juniperus communis | + A2 | with young fruit, new shoot growth up to 3 cm |

HERBS (cover, abundance, height, phenology)

| | | | |
|---|---|---|---|
| Lupinus innovatus | C4 A13 | to 60cm | flowering |
| Lupinus pumpellianus | C2 A12 | to 60cm | flowering |
| Aster laevis | C2 A11 | to 30cm | with flower buds |
| Poa interior | C2 A11(tussocks) | to 30cm | flowering |
| Hedysarum sulphurescens | C2 A10 | to 30cm | past peak of flowering |
| Achillea millefolium | C1 A11 | to 25cm | a few flowering, mostly vegetative |
| Koeleria cristata | C1 A10 | to 30cm | flowering |
| Cerastium arvense | C1 A10 | to 15cm | past peak of flowering |
| Antennaria rosea | C1 mats | to 30cm | at peak of flowering |
| Galium boreale | C1 A10 | to 20cm | at peak of flowering |
| Gaillardia aristata | C1 A9 | to 40cm | beginning to flower |
| Senecio multiradiatus | C1 A9 | to 20cm | flowering |
| Agoseris glauca | C1 A9 | to 20cm | with flower buds |
| Vicia americana | C1 A9 | to 25cm | at peak of flowering |
| Campanula rotundifolia | C1 A9 | to 30cm | at peak of flowering |
| Linum lewisii | C1 A9 | to 30cm | at peak of flowering |
| Smilacina stellata | C1 A8 | to 15cm | vegetative only |
| Senecio canus | + A7 | to 30cm | with flower buds |
| Fragaria virginiana | + A7 | to 10cm | with flowers and fruit |
| Penstemon confertus | + A7 | to 20cm | at peak of flowering |
| Gentiana amarella | + A7 | to 15cm | with flower buds |
| Anemone multifida | + A6 | to 30cm | past peak of flowering |
| Festuca scabrella | + A4(tussocks) | to 1m | flowering |
| Oxytropis monticola | + A5 | to 20cm | with flower buds |
| Allium cernuum | + A5 | to 20cm | with flower buds |
| Draba aurea | + A5 | to 10cm | in fruit |
| Androsace septentrionalis | + A2 | 5cm | in fruit |
| Sedum lanceolatum | + A1 | 5cm | flowering |
| Taraxacum officinale | + A1 | | basal rosette |
| Anemone patens | + A1 | 20cm | in fruit |

MOSSES AND LICHENS (cover)

On rocks only (mosses +, crustose lichens +)

EPIPHYTES (common/ frequent/ scarce/ rare) NONE
OTHER COMMENTS

Populus tremuloides stunted by wind exposure, not reaching tree height. Isolated trees of Pinus contorta var. latifolia and Picea engelmannii occur in this habitat.
Also recorded for this stand (but outside the quadrat): Castilleja miniata (flowering).

| Cover Scale | |
|---|---|
| + | < 1% |
| 1 | 1-5% |
| 2 | 6-15% |
| 3 | 16-25% |
| 4 | 26-50% |
| 5 | 51-75% |
| 6 | 76-85% |
| 7 | 86-95% |
| 8 | 96-100% |

| Abundance Scale | |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3-4 |
| 4 | 5-8 |
| 5 | 9-16 |
| 6 | 17-32 |
| 7 | 33-64 |
| 8 | 65-128 |
| 9 | 129-256 |
| 10 | 257-512 |
| 11 | 513-1024 |
| 12 | 1025-2048 |
| 13 | 2049-4096 |
| 14 | 4097-8192 |
| 15 | 8193-16384 |
| 16 | 16385-32768 |

(in terms of stems distinct at ground level, unless otherwise stated)

PLATEAU MOUNTAIN SURVEY — STAND DESCRIPTION

Vegetation Type: Subalpine spruce-fir forest  Sample No.: 2  Location: above Plateau Creek NE 24-15-5-W5  Date: 21st July 1982
Elevation: 5700 ft.  Slope: 40-60%  Aspect: NE  Quadrat Sizes: 20m for trees, 15m for tall/low shrubs, 10m for others
Landform & Topography: Stable saprolite slope above creek, rolling

Drainage Class: well  Hygrotope: subxeric
Soil: Orthic Eutric Brunisol (organic "duff" 5-10 cm, 2 cm Ah, at least 30 cm yellow-brown Bm) over saprolite
Ground cover other than vegetation (e.g. rocks, water, deadfall, bare soil)
Deadfalls C1
Successional status (early/ intermediate/ advanced/ (mature))
TREES >5m (cover, number, dbh, height, age if cored, regeneration)
Picea engelmannii C5 ±35 trees 11-36 cm dbh 5-25 m high up to 225 years sparse
(34 cm dbh tree cored 20 cm above ground – 220 rings counted + 5 allowance for height ≐ 225 years)
Abies lasiocarpa C2 6 trees 8-30 cm dbh 5-25 m high – dense
(larger trees not corable, rotten inside)

TALL SHRUBS 2-5m (cover, abundance, phenology)
Abies lasiocarpa C1 A4 new shoot growth up to 5 cm

LOW SHRUBS 0.5-2m (cover, abundance, phenology)
Abies lasiocarpa C1 A4 (phenology as above)
Menziesia glabella + A2(bushes) new shoot growth up to 7 cm (bushes mostly killed back to below 0.5 m)
Picea engelmannii + A2 new shoot growth up to 5 cm

DWARF SHRUBS <0.5m (cover, abundance, phenology)
Menziesia glabella C2 A6(bushes) in flower
Vaccinium scoparium C2 A12 vegetative, new shoot growth 2-3 cm
Linnaea borealis C1 mats in flower, new shoot growth 2-3 cm
Vaccinium myrtillus C1 A11 vegetative, new shoot growth 2-3 cm
Abies lasiocarpa C1 A7 (phenology as above)
Picea engelmannii + A3 (phenology as above)

HERBS (cover, abundance, height, phenology)
Cornus canadensis C1 A9 to 10 cm mostly vegetative, a few flowering
Arnica cordifolia C1 A7 basal leaves only
Pyrola secunda + A7 vegetative
Pyrola chlorantha + A7 to 15 cm with flower buds
Poa interior + A6(tussocks) to 25 cm mostly vegetative, a few flowering
Elymus innovatus + A5 vegetative
Carex concinnoides + A5 to 15 cm flowering
Equisetum scirpoides + A5 vegetative
Zygadenus occidentale + A2 basal leaves only
Equisetum pratense + A1 15 cm vegetative

MOSSES AND LICHENS (cover)
Extensive mats (C7) of Pleurozium schreberi and Hylocomium splendens; also identified in samples were Dicranum scoparium, Polytrichum juniperum, Tomenthypnum austriacum and the liverwort Barbilophozia lycopodioides. Peltigera aphthosa C2; Cladonia scarce (+)
EPIPHYTES (common/ frequent/ scarce/ rare) Bryoria, Usnea and Fistulariella common; foliose lichens scarce.
OTHER COMMENTS
This stand is probably close to climax composition, since the denser regeneration of Abies lasiocarpa is compensated by the lower longevity of this species. Old specimens of Pinus contorta var. latifolia also occur occasionally in this stand.
Other species noted outside the quadrat: Viburnum edule and Moneses uniflora.
Openings in this stand additionally support: Shepherdia canadensis, Rosa acicularis, Juniperus communis, Ribes lacustre, Lonicera involucrata, Aster conspicuus, Aquilegia flavescens, Senecio lugens, Hedysarum sulphurescens and Epilobium angustifolium.

J. C. Griffiths

Cover Scale

| | |
|---|---|
| + | <1% |
| 1 | 1-5% |
| 2 | 6-15% |
| 3 | 16-25% |
| 4 | 26-50% |
| 5 | 51-75% |
| 6 | 76-85% |
| 7 | 86-95% |
| 8 | 96-100% |

Abundance Scale

| | |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3-4 |
| 4 | 5-8 |
| 5 | 9-16 |
| 6 | 17-32 |
| 7 | 33-64 |
| 8 | 65-128 |
| 9 | 129-256 |
| 10 | 257-512 |
| 11 | 513-1024 |
| 12 | 1025-2048 |
| 13 | 2049-4096 |
| 14 | 4097-8192 |
| 15 | 8193-16384 |
| 16 | 16385-32768 |

(in terms of stems distinct at ground level, unless otherwise stated)

PLATEAU MOUNTAIN SURVEY — STAND DESCRIPTION

**Vegetation Type:** Subalpine spruce-fir forest **Sample No.:** 3 **Location:** Wilkinson Pass SE25-14-5-W5 **Date:** 22nd July 1982

**Elevation:** 6600 ft. **Slope:** 10-20% **Aspect:** SW **Quadrat Sizes:** 20m for trees, 15m for tall/low shrubs, 10m for others

**Landform & Topography:** ground moraine, slightly rolling

**Drainage Class:** moderately well **Hygrotope:** mesic to subhygric

**Soil:** Orthic Eutric Brunisol (shallow organic layer, Ah 5 cm, at least 20 cm chestnut-brown Bm) over silty sand till

**Ground cover other than vegetation (e.g. rocks, water, deadfall, bare soil)**
Deadfalls C1 Standing dead trees C1

**Successional status (early/ intermediate/ (advanced)/ mature)**

**TREES >5m (cover, number, dbh, height, age if cored, regeneration)**

Picea engelmannii C5 ±50 trees 13-43 cm dbh 10-30 m high up to 280 years moderate
(43 cm dbh tree cored 70 cm above ground — 270 rings counted + 10 allowance for height ≈ 280 years)

Pinus contorta var. latifolia C1 5 trees 20-38 cm dbh 20-25 m high up to 210 years none
(38 cm dbh tree cored 40 cm above ground — 201 rings counted + 10 allowance for height ≈ 210 years)

Abies lasiocarpa + 2 trees 9 and 20 cm dbh 10 and 18 m high — dense

**TALL SHRUBS 2-5m (cover, abundance, phenology)**

Abies lasiocarpa + A3 new shoot growth 3-5 cm

**LOW SHRUBS 0.5-2m (cover, abundance, phenology)**

Shepherdia canadensis C1 A5 (bushes) with young fruit, new shoot growth 1 cm
Abies lasiocarpa C1 A4 (phenology as above)
Picea engelmannii + A1 new shoot growth 3 cm

**DWARF SHRUBS <0.5m (cover, abundance, phenology)**

| | | | |
|---|---|---|---|
| Vaccinium myrtillus | C3 | A13 | vegetative, new shoot growth up to 3 cm |
| Vaccinium scoparium | C2 | A12 | vegetative, new shoot growth up to 3 cm |
| Abies lasiocarpa | C1 | A8 | new shoot growth 1-3 cm |
| Picea engelmannii | + | A5 | new shoot growth 1-3 cm |
| Pinus albicaulis | + | A1 | new shoot growth 1 cm |
| Salix glauca | + | A1 | new shoot growth 3-4 cm |

**HERBS (cover, abundance, height, phenology)**

| | | | | |
|---|---|---|---|---|
| Arnica cordifolia | C5 | A12 | to 35 cm | mostly vegetative, a few flowering |
| Angelica dawsonii | C2 | A11 | to 60 cm | at peak of flowering |
| Valeriana sitchensis | C2 | A10 | to 60 cm | at peak of flowering |
| Hedysarum sulphurescens | C2 | A10 | to 30 cm | mostly vegetative, a few flowering |
| Carex concinnoides | C1 | A11 | to 20 cm | flowering |
| Senecio bracteosa | C1 | A10 | to 40 cm | flowering ± completed |
| Antennaria racemosa | C1 | A10 | to 20 cm | mostly vegetative, a few flowering |
| Stenanthium occidentale | C1 | A10 | to 30 cm | with flower buds |
| Solidago multiradiata | C1 | A7 | | basal leaves only |
| Agoseris glauca | + | A2 | | basal leaves only |
| Senecio pauperculus | + | A2 | | basal leaves only |
| Elymus innovatus | + | A6 | | basal leaves only |
| Arnica latifolia | + | A5 | | basal leaves only |
| Fragaria virginiana | + | A5 | to 10 cm | mostly vegetative, a few flowering |
| Epilobium angustifolium | + | A3 | to 20 cm | vegetative stems |

**MOSSES AND LICHENS (cover)**

Mosses C6: Hylocomium splendens, Dicranum scoparium and D. brevifolium var. brevifolium identified in samples.
Barbilophozia hatcheri + Peltigera aphthosa C3

**EPIPHYTES (common/ (frequent)/ scarce/ rare)** Fistulariella and Bryoria

**OTHER COMMENTS**

Other species in this stand (outside the quadrat): Menziesia glabella, Rhododendron albiflorum, Osmorhiza depauperata (flowering), Pyrola chlorantha (flowering) and Thalictrum occidentale.

Pinus albicaulis of tree size are present in this stand. The lack of regeneration of Pinus contorta suggests that it will eventually be eliminated, while the proportion of Abies lasiocarpa will increase.

| Cover Scale | |
|---|---|
| + | <1% |
| 1 | 1-5% |
| 2 | 6-15% |
| 3 | 16-25% |
| 4 | 26-50% |
| 5 | 51-75% |
| 6 | 76-85% |
| 7 | 86-95% |
| 8 | 96-100% |

| Abundance Scale | |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3-4 |
| 4 | 5-8 |
| 5 | 9-16 |
| 6 | 17-32 |
| 7 | 33-64 |
| 8 | 65-128 |
| 9 | 129-256 |
| 10 | 257-512 |
| 11 | 513-1024 |
| 12 | 1025-2048 |
| 13 | 2049-4096 |
| 14 | 4097-8192 |
| 15 | 8193-16384 |
| 16 | 16385-32768 |

(in terms of stems distinct at ground level, unless otherwise stated)

L.C. Griffiths

PLATEAU MOUNTAIN SURVEY

# STAND DESCRIPTION

**Vegetation Type:** Herb-willow carr **Sample No.:** 4 **Location:** Larch Creek SE36-14-5-W5 **Date:** 22nd July 1982
**Elevation:** 7000 ft. **Slope:** 10-20% **Aspect:** SSW **Quadrat Sizes:** 15m for tall/low shrubs, 10m for others
**Landform & Topography:** Alluvial fan (with intermittent stream) on bench above creek

**Drainage Class:** imperfect **Hygrotope:** Subhygric
**Soil:** Rego Black Chernozem (organic humus 5 cm, at least 25 cm blackish brown Ah) over alluvial silt and gravel

**Ground cover other than vegetation (e.g. rocks, water, deadfall, bare soil)**
Rodent diggings (pocket gophers and ground squirrels) C1

**Successional status (early/ intermediate/ advanced/ (mature))**

**TREES >5m (cover, number, dbh, height, age if cored, regeneration)**

NONE

**TALL SHRUBS 2-5m (cover. abundance, phenology)**

NONE

**LOW SHRUBS 0.5-2m (cover, abundance, phenology)**

Salix glauca C3 A8(bushes) with ripe fruit, new shoot growth up to 6 cm
Potentilla fruticosa C1 A5(bushes) flowering, new shoot growth up to 5 cm

**DWARF SHRUBS <0.5m (cover. abundance, phenology)**

Potentilla fruticosa C1 A4(bushes) (phenology as above)
Picea engelmannii + A2 new shoot growth 2-3 cm

**HERBS (cover, abundance, height, phenology)**

Deschampsia caespitosa C3 A10(tussocks) to 50 cm flowering
Epilobium angustifolium C3 A12 to 50 cm with flower buds
Bromus pumpellianus C2 A12 to 70 cm flowering
Aster foliaceus C2 A12 to 35 cm with flower buds
Allium schoenoprasum C2 A10 to 50 cm flowering
Fragaria virginiana C1 A11 to 20 cm flowering
Agoseris glauca C1 A10 to 30 cm with flower buds
Myosotis alpestris C1 A10 to 40 cm at peak of flowering
Cerastium arvense C1 A10 to 35 cm at peak of flowering
Achillea millefolium C1 A10 to 35 cm with flowers and flower buds
Allium cernuatum C1 A10 to 35 cm flowering
Juncus balticus var montanus C1 A13 to 50 cm flowering
Carex alpestris C1 A9 to 60 cm flowering
Taraxacum officinale C1 A9 to 40 cm at peak of flowering
Thalictrum occidentale C1 A7 to 55 cm in fruit
Potentilla diversifolia C1 A7 to 40 cm flowering
Astragalus robbinsii C1 A7 to 30 cm at peak of flowering
Allium boreale + A7 to 20 cm stem elongating (but no flower buds yet)
Poa grayana + A6 to 60 cm flowering
Agropyron latiglume + A6 to 50 cm flowering
Hesperon procerus + A6 to 30 cm flowering
Draba aurea + A6 to 35 cm in flower and fruit
Zygadenus elegans + A5 to 35 cm at peak of flowering
Castilleja miniata + A5 to 25 cm at peak of flowering
Valeriana dioica + A5 to 45 cm at peak of flowering
Draba borealis + A5 to 35 cm in flower and fruit
Phacelia franklinii + A5 seedlings on rodent diggings
Carex microptera + A4 to 25 cm in fruit
Veronica wormskjoldii + A4 to 20 cm flowering
Arabis drummondii + A4 to 50 cm in fruit
Senecio lugens + A3 to 30 cm flowering
Luzula parviflora + A3 to 60 cm in fruit
Poa interior + A2(tussocks) to 30 cm in flower
Poa alpina + A1 20 cm flowering

**MOSSES AND LICHENS (cover)**

NONE

**EPIPHYTES (common/ frequent/ scarce/ rare)** NONE

**OTHER COMMENTS**

The prominence of Epilobium angustifolium and Taraxacum officinale and presence of Phacelia franklinii in this stand is due to rodent activity (digging by pocket gophers and ground squirrels).

| Cover Scale | |
|---|---|
| + | <1% |
| 1 | 1-5% |
| 2 | 6-15% |
| 3 | 16-25% |
| 4 | 26-50% |
| 5 | 51-75% |
| 6 | 76-85% |
| 7 | 86-95% |
| 8 | 96-100% |

| Abundance Scale | |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3-4 |
| 4 | 5-8 |
| 5 | 9-16 |
| 6 | 17-32 |
| 7 | 33-64 |
| 8 | 65-128 |
| 9 | 129-256 |
| 10 | 257-512 |
| 11 | 513-1024 |
| 12 | 1025-2048 |
| 13 | 2049-4096 |
| 14 | 4097-8192 |
| 15 | 8193-16384 |
| 16 | 16385-32768 |

(in terms of stems distinct at ground level, unless otherwise stated)

PLATEAU MOUNTAIN SURVEY

# STAND DESCRIPTION

Vegetation Type: Upper subalpine spruce-fir-larch forest  Sample No.: 5  Location: head of larch Creek NE36-14-5-W5  Date: 23rd July 1982

Elevation: 7200 ft.  Slope: 0-10%  Aspect: SE shore sloping  Quadrat Sizes: 20m for trees, 15m for tall/low shrubs, 10m for others

Landform & Topography: Saddle, uniform, with occasional exposures of saprolite

Drainage Class: well  Hygrotope: mesic

Soil: Orthic Regosol (± 2 cm median-brown Ah over ashy grey C Layer with rock fragments)

Ground cover other than vegetation (e.g. rocks, water, deadfall, bare soil)
Deadfalls C1  Bare soil and rock fragments C1

Successional status (early/ intermediate/ (advanced)/ mature)

TREES > 5m (cover, number, dbh, height, age if cored, regeneration)

Picea engelmannii C4 ±100 trees 6-24 cm dbh 5-10m high up to 105 years moderate
(24cm dbh tree cored 30 cm above ground – 96 rings counted + 10 allowance for height ≙ 105 years)

Larix lyallii C1 ±20 trees 8-18 cm dbh 5-11 m high up to 120 years moderate
(18cm dbh tree cored 18 cm above ground – 114 rings counted + 6 allowance for height ≙ 120 years)

Pinus contorta var. latifolia C1 5 trees 9-18 cm dbh 5-12 m high — sparse

Abies lasiocarpa + 5 trees 6-14 cm dbh 5-7m high — moderate

TALL SHRUBS 2-5m (cover, abundance, phenology)

| | | | |
|---|---|---|---|
| Picea engelmannii | C1 | A5 | new shoot growth 1-5 cm |
| Larix lyallii | + | A3 | new shoot growth 4-8 cm |
| Abies lasiocarpa | + | A2 | new shoot growth 2-5 cm |

LOW SHRUBS 0.5-2m (cover, abundance, phenology)

| | | | |
|---|---|---|---|
| Abies lasiocarpa | C2 | AB | mostly originated by layering (phenology as above) |
| Picea engelmannii | C1 | A6 | (phenology as above) |
| Betula glandulosa | + | A6 | new shoot growth up to 2 cm |
| Larix lyallii | + | A4 | (phenology as above) |
| Pinus contorta var. latifolia | + | A1 | new seedlies just emerging from buds |

DWARF SHRUBS < 0.5m (cover, abundance, phenology)

| | | | |
|---|---|---|---|
| Vaccinium scoparium | C6 | A15 | with flowers and flower buds, new shoot growth up to 2 cm |
| Phyllodoce glanduliflora | C5 | A15 | mats with flowers and flower buds, new shoot growth up to 3 cm |
| Betula glandulosa | + | A6 | (phenology as above) |
| Abies lasiocarpa | + | A6 | (phenology as above) |
| Picea engelmannii | + | A4 | new shoot growth up to 2 cm |
| Larix lyallii | + | A3 | new shoot growth 5-6 cm |

HERBS (cover, abundance, height, phenology)

| | | | |
|---|---|---|---|
| Arenaria lanata | C2 | A11 | to 20 cm mostly vegetative, a few flowering |
| Erigeron peregrinus | C1 | A7 | basal leaves only |
| Arnica latifolia | + | A6 | to 20 cm mostly vegetative, a few flowering |
| Sibbaldia procumbens | + | A6 | vegetative |
| Potentilla diversifolia | + | A5 | basal leaves only |
| Carex rossii | + | A5 | to 5 cm in fruit |
| Senecio cusickii var. aphis | + | A4 | to 30 cm flowering |
| Solidago multiradiata | + | A3 | basal leaves only |

MOSSES AND LICHENS (cover)

Mosses C2, mainly around bases of trees: Dicranum scoparium, Bryum sp. and Brachythecium cf. starkii identified in samples.

Cladonia C1 (on open ground) Crustose yellow lichen on exposed rock fragments (+)

EPIPHYTES (common/ (frequent)/ scarce/ rare) Fistulariella especially on old larch; Bryoria on old spruce; grey and yellow foliose and crustose lichens on dead lower branches of spruce and fir.

OTHER COLLENTS

The frequency of Pinus contorta may be expected to decline as this stand ages, while that of Abies Lasiocarpa should increase. The frequency of larch appears stable. Picea albicaulis also occurs in this stand, but is scarce. Accordingly, a spruce-fir-larch climax is assumed.

Also noted outside the quadrat: Luzula parviflora.

Cover Scale

| | |
|---|---|
| + | < 1% |
| 1 | 1-5% |
| 2 | 6-15% |
| 3 | 16-25% |
| 4 | 26-50% |
| 5 | 51-75% |
| 6 | 76-85% |
| 7 | 86-95% |
| 8 | 96-100% |

Abundance Scale

| | |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3-4 |
| 4 | 5-8 |
| 5 | 9-16 |
| 6 | 17-32 |
| 7 | 33-64 |
| 8 | 65-128 |
| 9 | 129-256 |
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| 12 | 1025-2048 |
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(in terms of stems distinct at ground level, unless otherwise noted)

PLATEAU MOUNTAIN SURVEY

# STAND DESCRIPTION

**Vegetation Type:** Moist talus tundra **Sample No.:** 6 **Location:** SE1-15-5-W5 above head of Platau Creek West **Date:** 23rd July 1982

**Elevation:** 7200 ft. **Slope:** 40-50% **Aspect:** W **Quadrat Sizes:** 10m

**Landform & Topography:** Stabilized talus slope, slightly rolling

**Drainage Class:** moderately well, seepage **Hygrotope:** mesic to subhygric

**Soil:** Orthic Eutric Brunisol (Ah 0-1 cm, at least 20 cm medium-brown Bm) over rubbly talus

**Ground cover other than vegetation (e.g. rocks, water, deadfall, bare soil)**

NONE

**Successional status (early/ intermediate/ advanced/ (mature))**

**TREES >5m (cover, number, dbh, height, age if cored, regeneration)**

NONE

**TALL SHRUBS 2-5m (cover. abundance, phenology)**

NONE

**LOW SHRUBS 0.5-2m (cover, abundance, phenology)**

NONE

**DWARF SHRUBS <0.5m (cover. abundance, phenology)**

Potentilla fruticosa C2 A5 (bushes) flowering

**HERBS (cover, abundance, height, phenology)**

Festuca scabrella C3 A7 (tussocks) to 50cm flowering
Carex atrosquama C2 A12 to 30cm in fruit
Carex albonigra C2 A12 to 30cm in fruit
Myosotis alpestris C2 A12 to 25cm at peak of flowering
[illegible] schoenoprasum C2 A11 to 50cm flowering
[illegible] boreale C1 A12 to 20cm flower buds frost damaged
[illegible]astium arvense C1 A13 to 30cm at peak of flowering
Achillea millefolium C1 A12 to 25cm mostly vegetative, a few flowering
[illegible]mus pumpellianus C1 A12 to 45cm flowering
[illegible] grayana C1 A12 to 35cm flowering
[illegible]oseris glauca C1 A11 to 25cm with flower buds
Solidago multiradiata C1 A10 to 20cm flowering
Eogaria virginiana C1 A10 to 10cm at peak of flowering
[illegible] interior C1 A8 (tussocks) to 30cm flowering
[illegible]tilla diversifolia C1 A10 to 30cm flowering
Luzula spicata C1 A10 to 25cm in fruit
Senecio lugens C1 A9 to 35cm flowering
[illegible]mex alpestris C1 A9 to 45cm flowering
[illegible]temonium pulcherrimum C1 A8 to 35cm at peak of flowering

Dodecatheon conjugens C1 A9 to 20cm in fruit
Antennaria pulcherrima C1 A8 to 25cm flowering
Oxytropis splendens C1 A7 to 20cm at peak of flowering
Geum triflorum C1 A7 to 25cm with flower buds
Anemone patens C1 A7 to 20cm in fruit
Bessya cinerea + A8 to 10cm flowering
Draba aurea + A7 to 12cm flowering
Astragalus alpinus + A6 to 15cm flowering
Hedysarum sulphurescens + A6 to 30cm flowering
Epilobium angustifolium + A5 to 30cm vegetative stems on rodent diggings
Zygadenus elegans + A4 to 25cm at peak of flowering
Sedum lanceolatum + A4 to 10cm flowering
Penstemon procerus + A3 to 25cm flowering
Allium cernuum + A3 to 30cm with flower buds
Castilleja occidentalis + A3 to 25cm flowering
Astragalus robbinsii + A1 to 25cm flowering
Campanula rotundifolia + A1 to 20cm flowering

**MOSSES AND LICHENS (cover)**

NONE

**EPIPHYTES (common/ frequent/ scarce/ rare)** NONE

**OTHER COMMENTS**

Other plants in this stand but outside the quadrat: Erigeron peregrinus, Delphinium bicolor and Antennaria umbrinella.

| Cover Scale | |
|---|---|
| + | <1% |
| 1 | 1-5% |
| 2 | 6-15% |
| 3 | 16-25% |
| 4 | 26-50% |
| 5 | 51-75% |
| 6 | 76-85% |
| 7 | 86-95% |
| 8 | 96-100% |

| Abundance Scale | |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3-4 |
| 4 | 5-8 |
| 5 | 9-16 |
| 6 | 17-32 |
| 7 | 33-64 |
| 8 | 65-128 |
| 9 | 129-256 |
| 10 | 257-512 |
| 11 | 513-1024 |
| 12 | 1025-2048 |
| 13 | 2049-4096 |
| 14 | 4097-8192 |
| 15 | 8193-16384 |
| 16 | 16385-32768 |

(in terms of stems distinct at ground level, unless otherwise stated)

PLATEAU MOUNTAIN SURVEY

# STAND DESCRIPTION

Vegetation Type: Moist hummocky tundra  Sample No.: 7  Location: NW31-14-4-W5  Date: 24th July 1982
Elevation: 7500 ft.  Slope: 5% overall (with variation due to hummocks)  Aspect: SE  Quadrat Sizes: 10m
Landform & Topography: Hummocky patterned ground (cryoturbated), with rubble exposed in hollows
Drainage Class: imperfect  Hygrotope: subhygric
Soil: Brunisolic Turbic Cryosol (tops of hummocks with 5cm grey-brown Ah over paler grey-brown Bm up to 15 cm)
Ground cover other than vegetation (e.g. rocks, water, deadfall, bare soil)
Rock fragments in hollows C1
Successional status (early/ intermediate/ advanced/ (mature))
TREES > 5m (cover, number, dbh, height, age if cored, regeneration)

NONE

TALL SHRUBS 2-5m (cover. abundance, phenology)

NONE

LOW SHRUBS 0.5-2m (cover, abundance, phenology)

NONE

DWARF SHRUBS < 0.5m (cover. abundance, phenology)
Salix glauca C2 A8 (bushes) in fruit, new shoot growth up to 4 cm

HERBS (cover, abundance, height, phenology)
Carex gymnoclada C6 A15 to 15cm with young fruit
Gentilla diversifolia C3 A13 to 25cm at peak of flowering
Deschampsia caespitosa C2 A9 (tussocks) to 35cm flowering
Allium schoenoprasum C2 A11 to 40cm at peak of flowering
Solidago multiradiata C1 A11 to 10cm with flower buds
Achillea millefolium C1 A11 to 15cm mostly vegetative, a few flowering
Poa alpina C1 A11 to 20cm flowering
Carex microptera C1 A11 to 15cm with young fruit
Gentiana prostrata C1 A11 to 5cm at peak of flowering
Stellaria monantha C1 A11 to 5cm at peak of flowering
Senecio lugens C1 A10 to 35cm at peak of flowering
Mosotis alpestris C1 A10 to 15cm at peak of flowering
Polygonum viviparum C1 A10 to 10cm flowering
Cerastium arvense C1 A10 to 10cm at peak of flowering
Rumex alpestris C1 A8 to 30cm flowering
Pedicularis groenlandica C1 A7 to 20cm at peak of flowering
Saxifraga calycina C1 A7 to 15cm with young fruit
Festuca brachyphylla + A8 to 10cm flowering, mainly in hollows
Castilleja occidentalis + A6 to 15cm flowering
Draba borealis + A6 to 15cm with flowers and young fruit
Ranunculus eschscholtzii + A5 to 5cm in flower and fruit
Sedum Canceolatum + A2 5cm flowering
Besseya cinerea + A2 to 15cm flowering
Agoseris glauca + A1 basal leaves only

MOSSES AND LICHENS (cover)
Mosses C5: Thuidium abietinum, Tortula ruralis, Tortula norvegica, Drepanocladus uncinatus, Bryum stenotrichum and Brachythecium cf. turgidum identified in samples.
Black crustose lichen on rock fragments (+)

EPIPHYTES (common/ frequent/ scarce/ rare) NONE

OTHER COMMENTS

Also noted in this stand outside the quadrat: Sibbaldia procumbens (in hollows) and Penstemon procerus.

Cover Scale

| | |
|---|---|
| + | < 1% |
| 1 | 1-5% |
| 2 | 6-15% |
| 3 | 16-25% |
| 4 | 26-50% |
| 5 | 51-75% |
| 6 | 76-85% |
| 7 | 86-95% |
| 8 | 96-100% |

Abundance Scale

| | |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3-4 |
| 4 | 5-8 |
| 5 | 9-16 |
| 6 | 17-32 |
| 7 | 33-64 |
| 8 | 65-128 |
| 9 | 129-256 |
| 10 | 257-512 |
| 11 | 513-1024 |
| 12 | 1025-2048 |
| 13 | 2049-4096 |
| 14 | 4097-8192 |
| 15 | 8193-16384 |
| 16 | 16385-32768 |

(in terms of stems distinct at ground level, unless otherwise stated)

Geo Griffiths

PLATEAU MOUNTAIN SURVEY

# STAND DESCRIPTION

Vegetation Type: Dryas tundra  Sample No.: 8  Location: Mid W 31-14-4-W5 on border of 36-14-5-W5  Date: 24th July 1982

Elevation: 7500 ft.  Slope: 10-20%  Aspect: W  Quadrat Sizes: 10m

Landform & Topography: Saprolite ridge (just below crest)

Drainage Class: rapid  Hygrotope: xeric

Soil: Orthic Regosol (yellow-brown soil without distinct horizons, in most places only a few cm deep) over saprolite

Ground cover other than vegetation (e.g. rocks, water, deadfall, bare soil)
Rock fragments C2

Successional status (early/ intermediate/ advanced/ (mature))

TREES >5m (cover, number, dbh, height, age if cored, regeneration)

NONE

TALL SHRUBS 2-5m (cover, abundance, phenology)

NONE

LOW SHRUBS 0.5-2m (cover, abundance, phenology)

NONE

DWARF SHRUBS <0.5m (cover, abundance, phenology)
Dryas octopetala ssp. hookeriana C6 mats with flowers and young fruit

HERBS (cover, abundance, height, phenology)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Oxytropis podocarpa | C4 | A13 | prostrate | in fruit | Trisetum spicatum | + | A7 to 10cm flowering |
| Hedysarum sulphurescens | C2 | A10 | to 15cm | at peak of flowering | Festuca brachyphylla | + | A7 to 10cm flowering |
| Arnica alpina ssp. tomentosa | C1 | A11 | to 10cm | with flower buds | Besseya cinerea | + | A7 to 10cm in fruit |
| Polygonum viviparum | C1 | A11 | to 10cm | in flower and fruit | Anemone drummondii | + | A6 to 8cm in fruit |
| Androsace chamaejasme | C1 | A11 | to 5cm | at peak of flowering | Poa pattersonii | + | A6 to 15cm flowering |
| Skelowskia calycina | C1 | A10 | to 10cm | in fruit | Anemone patens | + | A5 to 15cm in fruit |
| Carex nardina | C1 | A11 | to 12cm | in fruit | Saxifraga occidentalis | + | A5 to 6cm flowering |
| Lupinus pumpellianus | C1 | A10 | to 10cm | flowering | Oxytropis cusickii | + | A4 to 20cm at peak of flowering |
| Potentilla diversifolia | C1 | A9 | to 15cm | at peak of flowering | Minuartia obtusiloba | + | A4 to 10cm flowering |
| Castilleja occidentalis | C1 | A8 | to 12cm | at peak of flowering | Sedum lanceolatum | + | A3 5cm flowering |
| Senecio lugens | C1 | A8 | to 15cm | at peak of flowering | | | |
| Potentilla nivea | C1 | A8 | to 12cm | at peak of flowering | | | |
| Hypochoeris alpestris | C1 | A8 | to 10cm | at peak of flowering | | | |
| Potentilla ovina | C1 | A7 | to 10cm | at peak of flowering | | | |
| Hedysarum elegans | C1 | A7 | to 10cm | with flower buds | | | |
| Antennaria alpinus | + | A7 | to 8cm | flowering | | | |

MOSSES AND LICHENS (cover)
Mosses scarce (+), mainly in rock crevices  Cetraria C1  Thamnolia +
Occasional crustose lichens (green, yellow and orange) on rock fragments (+)

EPIPHYTES (common/ frequent/ scarce/ rare) NONE

OTHER COMMENTS

Other plants noted in this stand outside the quadrat: Salix nivalis, Erigeron aureus, Haplopappus lyallii, Silene acaulis and Antennaria umbrinella.

| Cover Scale | |
|---|---|
| + | <1% |
| 1 | 1-5% |
| 2 | 6-15% |
| 3 | 16-25% |
| 4 | 26-50% |
| 5 | 51-75% |
| 6 | 76-85% |
| 7 | 86-95% |
| 8 | 96-100% |

| Abundance Scale | |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3-4 |
| 4 | 5-8 |
| 5 | 9-16 |
| 6 | 17-32 |
| 7 | 33-64 |
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| 12 | 1025-2048 |
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(in terms of stems distinct at ground level, unless otherwise stated)

PLATEAU MOUNTAIN SURVEY

# STAND DESCRIPTION

**Vegetation Type:** Herb-willow carr **Sample No.:** 9 **Location:** SE1-15-5-W5 **Date:** 24th July 1982
**Elevation:** 7300 ft. **Slope:** 10-20% **Aspect:** WSW **Quadrat Sizes:** 15m for tall/low shrubs, 10m for others
**Landform & Topography:** Alluvial slope (with small stream outside quadrat), terraced
**Drainage Class:** imperfect, seepage **Hygrotope:** Subhygric
**Soil:** Rego Black Chernozem (5cm medium-brown organic layer, 10-15cm blackish Ah) over alluvial silt and gravel
**Ground cover other than vegetation (e.g. rocks, water, deadfall, bare soil)** Rodent diggings +
**Successional status (early/ intermediate/ advanced/ (mature))**
**TREES >5m (cover, number, dbh, height, age if cored, regeneration)**

NONE

**TALL SHRUBS 2-5m (cover. abundance, phenology)**

NONE

**LOW SHRUBS 0.5-2m (cover, abundance, phenology)**
Salix glauca C3 A11 in fruit, new shoot growth 4-6 cm
Salix barrattiana C3 A11 in fruit, new shoot growth 5-10 cm
Potentilla fruticosa C1 A4(bushes) at peak of flowering, new shoot growth up to 5 cm

**DWARF SHRUBS <0.5m (cover. abundance, phenology)**
Salix barrattiana C1 A7 (phenology as above)
Salix glauca + A5 (phenology as above)
Potentilla fruticosa + A4(bushes) (phenology as above)

**HERBS (cover, abundance, height, phenology)**
Carex gynocrata C4 A13 to 30cm in fruit
Calamagrostis canadensis C4 A13 to 45cm in fruit
Aster foliaceus C2 A11 to 30cm with flowerbuds
Erigeron peregrinus C2 A11 to 50cm flowering
Carex scheenoprasum C2 A10 to 60cm at peak of flowering
Achillea millefolium C1 A11 to 30cm flowering
Bromus pumellianus C1 A10 to 45cm flowering
Agrostis grayana C1 A10 to 40cm flowering
Potentilla diversifolia C1 A9 to 55cm at peak of flowering
Hyosoris glauca C1 A9 to 15cm with flowerbuds
Valeriana sitchensis C1 A8 to 50cm at peak of flowering
Epilobium angustifolium C1 A8 to 55cm vegetative stems
Solidago multiradiata C1 A8 to 25cm with flowerbuds
Myosotis alpestris C1 A8 to 30cm at peak of flowering
Trollius albiflorus C1 A7 to 50cm in fruit
Pedicularis bracteosa C1 A7 to 45cm flowering
Stellaria conjugens C1 A7 to 30cm in fruit
Delphinium bicolor + A6 to 45cm flowering
Rumex alpestris + A6 to 60cm flowering
Poa alpina + A6 to 30cm flowering
Silene parryi + A5 to 20cm with flowerbuds
Astragalus robbinsii + A5 to 30cm flowering
Polemonium pulcherrimum + A5 to 25cm flowering
Festuca scabrella + A3(tussocks) to 65cm flowering
Hedysarum sulphurescens + A4 to 35cm flowering
Zygadenus elegans + A3 to 30cm with flowerbuds
Astragalus alpinus + A3 to 30cm flowering
Phleum commutatum + A3 to 35cm flowering
Arnica latifolia + A1 basal leaves only
Luzula parviflora + A1 45cm in fruit
Ranunculus pedatifidus + A1 15cm flowering
Senecio lugens + A1 35cm flowering
Draba aurea + A1 20cm flowering

**MOSSES AND LICHENS (cover)**

NONE

**EPIPHYTES (common/ frequent/ scarce/ rare)** NONE
**OTHER COMMENTS**

Other plants noted in this stand outside the quadrat: Castilleja occidentalis, Castilleja miniata, Valeriana dioica, Pedicularis groenlandica and Deschampsia caespitosa.

| Cover Scale | |
|---|---|
| + | <1% |
| 1 | 1-5% |
| 2 | 6-15% |
| 3 | 16-25% |
| 4 | 26-50% |
| 5 | 51-75% |
| 6 | 76-85% |
| 7 | 86-95% |
| 8 | 96-100% |

| Abundance Scale | |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3-4 |
| 4 | 5-8 |
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| 13 | 2049-4096 |
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| 15 | 8193-16384 |
| 16 | 16385-32768 |

(in terms of stems distinct at ground level, unless otherwise stated)

G. Griffiths

PLATEAU MOUNTAIN SURVEY

# STAND DESCRIPTION

**Vegetation Type:** Seral subalpine scrub (after fire) **Sample No.:** 10 **Location:** above Dry Creek NW30-14-4-W5 **Date:** 25th July 1982
**Elevation:** 6900 ft. **Slope:** 50% **Aspect:** WSW **Quadrat Sizes:** 20m for trees, 15m for tall/low shrubs, 10m for others
**Landform & Topography:** More or less stabilized talus slope, rubbly, uniform
**Drainage Class:** well **Hygrotope:** mesic to subxeric
**Soil:** Orthic Eutric Brunisol (2 cm dark brown Ah over light brown Bm of indeterminate depth, at least 15 cm, mixed with rubble)
**Ground cover other than vegetation (e.g. rocks, water, deadfall, bare soil)**
Deadfalls C2 Soil and rubble C1 (partly exposed by rodent digging) Blocks +
**Successional status (early/ intermediate/ advanced/ mature)**
**TREES >5m (cover, number, dbh, height, age if cored, regeneration)**
Pinus contorta var. latifolia + 1 tree 19 cm dbh 8m high 50 years sparse
(cored 30 cm above ground - 45 rings counted + 5 allowance for height = 50 years)

**TALL SHRUBS 2-5m (cover. abundance, phenology)**

| | | | |
|---|---|---|---|
| Salix albicaulis | + | A1 | new shoot growth up to 8 cm |
| Picea engelmannii | + | A1 | new shoot growth up to 15 cm |

**LOW SHRUBS 0.5-2m (cover, abundance, phenology)**

| | | | |
|---|---|---|---|
| Salix glauca | C2 | A8 (bushes) | in fruit, new shoot growth 3-5 cm |
| Salix albicaulis | + | A4 | (phenology as above) |
| Salix lasiocarpa | + | A2 | new shoot growth up to 11 cm |
| Picea engelmannii | + | A1 | new shoot growth up to 5 cm |

**DWARF SHRUBS <0.5m (cover. abundance, phenology)**

| | | | |
|---|---|---|---|
| Arctostaphylos uva-ursi | C5 | mats | with young fruit, new shoot growth up to 3 cm |
| Shepherdia canadensis | C1 | A7 | new shoot growth up to 2 cm |
| Juniperus communis | + | A5 | flowering, new shoot growth up to 2 cm |
| Ribes lacustre | + | A5 | frost damaged, new shoot growth up to 2 cm |
| Salix glauca | + | A4 | (phenology as above) |
| Potentilla fruticosa | + | A2 | new shoot growth 2-3 cm |
| Abies lasiocarpa | + | A1 | new shoot growth up to 2 cm |

**HERBS (cover, abundance, height, phenology)**

| | | | |
|---|---|---|---|
| Hedysarum sulphurescens | C3 | A12 | to 30 cm at peak of flowering |
| Bromus pumpellianus | C2 | A14 | to 40 cm mostly vegetative, a few flowering |
| Achillea millefolium | C2 | A12 | to 20 cm with flower buds |
| Fragaria virginiana | C2 | A11 | to 10 cm flowering |
| Carex interior | C1 | A10 (tussocks) | to 25 cm flowering |
| Arnica cordifolia | C1 | A11 | basal leaves only |
| Galium boreale | C1 | A11 | to 15 cm with flower buds |
| Anemone multifida | C1 | A10 | to 20 cm in fruit |
| Solidago multiradiata | C1 | A10 | to 20 cm at peak of flowering |
| Agropyron latiglume | C1 | A9 | to 45 cm flowering |
| Elymus innovatus | C1 | A9 | to 40 cm flowering |
| Festuca scabrella | C1 | A7 (tussocks) | to 55 cm flowering |
| Myosotis alpestris | C1 | A8 | to 15 cm at peak of flowering |
| Aster sibiricus | C1 | A8 | to 15 cm with flower buds |
| Androsace chamaejasme | + | A9 | to 5 cm flowering |
| Arnica arvense | + | A8 | to 10 cm flowering |
| Antennaria umbrinella | + | mats | to 15 cm flowering |
| Agoseris glauca | + | A7 | basal leaves only |
| Poa alpina | + | A7 | to 25 cm flowering |
| Minuartia rubella | + | A7 | to 5 cm flowering |
| Astragalus eucosmus | + | A7 | to 15 cm flowering |
| Sedum lanceolatum | + | A7 | to 10 cm flowering |
| Aster foliaceus | + | A7 | basal leaves only |
| Potentilla diversifolia | + | A7 | to 30 cm at peak of flowering |
| Senecio streptanthifolius | + | A7 | to 10 cm at peak of flowering |
| Epilobium angustifolium | + | A5 | to 30 cm vegetative stems |
| Saxifraga occidentalis | + | A5 | to 20 cm flowering |
| Senecio lugens | + | A5 | to 15 cm at peak of flowering |
| Anemone patens | + | A4 | to 20 cm in fruit |
| Draba aurea | + | A4 | to 15 cm in flower and fruit |
| Allium cernuum | + | A3 | to 25 cm flowering |
| Polemonium pulcherrimum | + | A1 | 20 cm flowering |
| Zygadenus elegans | + | A1 | 25 cm with flower buds |
| Festuca brachyphylla | + | A1 | 12 cm flowering |
| Minuartia obtusiloba | + | A1 | 10 cm flowering |
| Gentiana amarella | + | A1 | 10 cm vegetative stem |

**MOSSES AND LICHENS (cover)**
Mosses scarce (+), on soil and in rock crevices
Occasional crustose lichens on rocks (+)

**EPIPHYTES (common/ frequent/ scarce/ rare)** NONE
**OTHER COMMENTS**
Other plants noted in this stand outside the quadrat: Castilleja miniata, Antennaria pulcherrima, Phacelia sericea and Saxifraga bronchialis.
The sparse establishment of tree seedlings since fire at least 50 years ago indicates that several centuries may be needed for succession to closed forest to occur on this site.

G.A. Griffiths

**Cover Scale**

| | |
|---|---|
| + | <1% |
| 1 | 1-5% |
| 2 | 6-15% |
| 3 | 16-25% |
| 4 | 26-50% |
| 5 | 51-75% |
| 6 | 76-85% |
| 7 | 86-95% |
| 8 | 96-100% |

**Abundance Scale**

| | |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3-4 |
| 4 | 5-8 |
| 5 | 9-16 |
| 6 | 17-32 |
| 7 | 33-64 |
| 8 | 65-128 |
| 9 | 129-256 |
| 10 | 257-512 |
| 11 | 513-1024 |
| 12 | 1025-2048 |
| 13 | 2049-4096 |
| 14 | 4097-8192 |
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(in terms of stems distinct at ground level, unless otherwise stated)

PLATEAU MOUNTAIN SURVEY

## STAND DESCRIPTION

Vegetation Type: *Talus barren* Sample No.: *11* Location: *above Dry Creek NW30-14-4-W5* Date: *25th July 1982*

Elevation: *7000 ft.* Slope: *50-60% overall (with variation due to blocks)* Aspect: *SW* Quadrat Sizes: *10m*

Landform & Topography: *Unstable talus scree (rubbly and blocky) in sheltered ravine*

Drainage Class: *rapid* Hygrotope: *xeric*

Soil: *Small shallow patches of humus only ("nonsoil")*

Ground cover other than vegetation (e.g. rocks, water, deadfall, bare soil)
*Rubble and blocks C7*

Successional status (early/ intermediate/ advanced/ (mature))

TREES >5m (cover, number, dbh, height, age if cored, regeneration)

*NONE*

TALL SHRUBS 2-5m (cover, abundance, phenology)

*NONE*

LOW SHRUBS 0.5-2m (cover, abundance, phenology)

*NONE*

DWARF SHRUBS <0.5m (cover, abundance, phenology)

| | | | |
|---|---|---|---|
| Arctostaphylos uva-ursi | C1 | mats | in fruit, new shoot growth 1-3 cm |
| Potentilla fruticosa | C1 | A8 | flowering, new shoot growth 2-3 cm |
| Ribes lacustre | C1 | A7 | with young fruit, new shoot growth 4-5 cm |
| Rosa acicularis | + | A7 | in fruit, new shoot growth 1-4 cm |
| Shepherdia canadensis | + | A4 | new shoot growth 2-3 cm |

HERBS (cover, abundance, height, phenology)

| | | | | | | |
|---|---|---|---|---|---|---|
| Anemone multifida | C1 | A9 | to 20cm | at peak of flowering | Poa rupicola | + A7 to 15cm flowering |
| Antennaria umbrinella | C1 | mats | to 8 cm | flowering | Cystopteris fragilis | + A7 to 10cm fronds with sporangia |
| Androsace chamaejasme | C1 | A10 | to 5cm | past peak of flowering | Minuartia rubella | + A7 to 5cm flowering |
| Senecio streptanthifolius | C1 | A9 | to 15cm | flowering | Saussurea densa | + A6 to 10cm flowering |
| Artemisia michauxiana | C1 | A9 | to 15cm | flowering | Aquilegia flavescens | + A6 to 25cm at peak of flowering |
| Stellaria monantha | C1 | A9 | to 5cm | flowering | Cerastium arvense | + A6 to 15cm flowering |
| Trisetum spicatum | C1 | A8 | to 20cm | flowering | Carex rupestris | + A5 to 10cm in fruit |
| Potentilla ovina | C1 | A7 | to 20cm | in flower and fruit | Campanula rotundifolia | + A5 to 10cm flowering |
| Agropyron scribneri | C1 | A7 | to 20cm | in flower | Astragalus vexilliflexus | + A4 to 5cm flowering |
| Hedysarum sulphurescens | C1 | A7 | to 20cm | flowering | Cirsium hookerianum | + A3 basal leaves only |
| Smelowskia calycina | C1 | A7 | to 10cm | in fruit | Draba incerta | + A3 to 8cm in fruit |
| Solidago multiradiata | C1 | A7 | to 10cm | with flowerbuds | Festuca saximontana | + A2 to 20cm flowering |
| Festuca baffinensis | + | A8 | to 5cm | flowering | Agropyron latiglume | + A2 to 15cm flowering |
| Erigeron compositus | + | A8 | to 8cm | flowering | Minuartia austromontana | + A2 2cm flowering |
| Sedum rosea | + | A8 | to 7cm | with flowerbuds | Myosotis alpestris | + A1 15cm flowering |
| Allium boreale | + | A8 | to 7cm | with flowers and flowerbuds | | |
| Aster sibiricus | + | A8 | to 10cm | flowering | | |
| Poa pattersonii | + | A7 | to 20cm | flowering | | |

MOSSES AND LICHENS (cover)

Lichens scarce (+), mostly Xanthoria on rocks

No mosses

EPIPHYTES (common/ frequent/ scarce/ rare) *NONE*

OTHER COMMENTS

*Other plants in this stand noted outside the quadrat: Calamagrostis purpurascens, Achillea millefolium, Aster alpinus and Saxifraga bronchialis.*

Cover Scale

| | |
|---|---|
| + | <1% |
| 1 | 1-5% |
| 2 | 6-15% |
| 3 | 16-25% |
| 4 | 26-50% |
| 5 | 51-75% |
| 6 | 76-85% |
| 7 | 86-95% |
| 8 | 96-100% |

Abundance Scale

| | |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3-4 |
| 4 | 5-8 |
| 5 | 9-16 |
| 6 | 17-32 |
| 7 | 33-64 |
| 8 | 65-128 |
| 9 | 129-256 |
| 10 | 257-512 |
| 11 | 513-1024 |
| 12 | 1025-2048 |
| 13 | 2049-4096 |
| 14 | 4097-8192 |
| 15 | 8193-16384 |
| 16 | 16385-32768 |

(in terms of stems distinct at ground level, unless otherwise stated)

PLATEAU MOUNTAIN SURVEY

# STAND DESCRIPTION

**Vegetation Type:** Kobresia tundra **Sample No.:** 12 **Location:** NW4-15-4-W5 in cirque **Date:** 13th August 1982
**Elevation:** 7100 ft. **Slope:** 5-10% **Aspect:** SSW **Quadrat Sizes:** 10m
**Landform & Topography:** Hummocky glacial moraine in cirque

**Drainage Class:** well **Hygrotope:** mesic
**Soil:** Orthic Regosol (0-6 cm turfy blackish brown Ah) over rubbly till
**Ground cover other than vegetation (e.g. rocks, water, deadfall, bare soil)** Rubble C1
**Successional status (early/ intermediate/ advanced/ (mature))**
**TREES >5m (cover, number, dbh, height, age if cored, regeneration)**

NONE

**TALL SHRUBS 2-5m (cover, abundance, phenology)**

NONE

**LOW SHRUBS 0.5-2m (cover, abundance, phenology)**

NONE

**DWARF SHRUBS <0.5m (cover, abundance, phenology)**

Potentilla fruticosa C1 A7 in fruit, shoot growth up to 2 cm
Salix glauca + A5 in fruit, shoot growth up to 2 cm
Dryas octopetala ssp. hookeriana + 1 mat in fruit

**HERBS (cover, abundance, height, phenology)**

Kobresia myosuroides C6 A15 to 15 cm in fruit
Bromus pumpellianus C2 A12 to 50 cm flowering
Hedysarum sulphurescens C2 A11 to 30 cm in fruit
Selaginella densa C2 mats prostrate
Poa alpina C1 A12 to 25 cm flowering
Polygonum viviparum C1 A11 to 20 cm in flower and fruit
Zygadenus elegans C1 A10 to 25 cm flowering
Myosotis alpestris C1 A9 to 20 cm in fruit
Androsace chamaejasme C1 A9 to 7 cm in fruit
Poa interior C1 A6(tussocks) to 20 cm flowering
Agoseris glauca C1 A8 to 25 cm flowering
Campanula rotundifolia C1 A8 to 20 cm at peak of flowering
Senecio lugens C1 A7 to 25 cm flowering
Poa cusbyi C1 A7 to 50 cm flowering
Rumex alpestris C1 A7 to 40 cm in fruit
Carex scirpoidea var. stenochlaena + A7 to 20 cm in fruit
Oxytropis cusickii C1 A7 to 20 cm in fruit
Aster alpinus + A6 to 15 cm in fruit
Anemone patens + A6 to 20 cm in fruit
Potentilla diversifolia + A6 to 20 cm in fruit
Calamagrostis purpurascens + A6 to 20 cm flowering
Festuca saximontana + A5 to 20 cm flowering
Sedum lanceolatum + A5 to 15 cm flowering
Allium schoenoprasum + A5 to 50 cm flowering
Minuartia obtusiloba + A5 to 5 cm in fruit
Draba borealis + A5 to 10 cm in fruit
Cerastium arvense + A5 to 10 cm vegetative only
Solidago multiradiata + A4 basal leaves only
Besseya cinerea + A4 to 20 cm in fruit
Festuca scabrella + A2(tussocks) to 60 cm flowering
Helictotrichon hookeri + A2 to 25 cm in flower
Astragalus aboriginum + A2 20 cm in fruit
Luzula spicata + A1 20 cm in flower
Saelowskia calycina + A1 15 cm in fruit
Senecio streptanthifolius + A1 20 cm in flower

**MOSSES AND LICHENS (cover)**

Mosses C3: Thuidium abietinum, Hypnum revolutum, Rhytidium rugosum, Tortula ruralis, Orthotrichum speciosum and Pseudoleskeella tectorum identified in samples.
Scattered Cetraria cf. laevigata, Cladonia and Stereocaulon on soil (C1); crustose lichens (yellow, orange, grey and black) on rock fragments (+)

**EPIPHYTES (common/ frequent/ scarce/ rare)** NONE

**OTHER COMMENTS**

The dominant Kobresia myosuroides was heavily infested with rust (swollen achenes encrusted with black spores).

Other plants noted in this stand outside the quadrat: Hedysarum mackenzii, Castilleja occidentalis, Pedicularis groenlandica, Gentiana prostrata, Gentiana propinqua, Sedum rosea, Achillea millefolium and Salix nivalis.

G. Griffiths

| Cover Scale | |
|---|---|
| + | <1% |
| 1 | 1-5% |
| 2 | 6-15% |
| 3 | 16-25% |
| 4 | 26-50% |
| 5 | 51-75% |
| 6 | 76-85% |
| 7 | 86-95% |
| 8 | 96-100% |

| Abundance Scale | |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3-4 |
| 4 | 5-8 |
| 5 | 9-16 |
| 6 | 17-32 |
| 7 | 33-64 |
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| 9 | 129-256 |
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| 11 | 513-1024 |
| 12 | 1025-2048 |
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(in terms of stems distinct at ground level, unless otherwise stated)

PLATEAU MOUNTAIN SURVEY

# STAND DESCRIPTION

Vegetation Type: Upper subalpine spruce-fir-whitebark pine forest  Sample No.: 13  Location: SE4-15-4-W5  Date: 14th August 1982
Elevation: 7000 ft.  Slope: 10-20%  Aspect: SSE  Quadrat Sizes: 20m for trees, 15m for tall low shrubs, 10m for others
Landform & Topography: Saprolite slope, rolling, rubbly

Drainage Class: well  Hygrotope: mesic
Soil: Orthic Eutric Brunisol (A layer scarcely retained, medium-brown Bm of varying depth up to 30 cm in depressions and along runoff channels) over rubble

Ground cover other than vegetation (e.g. rocks, water, deadfall, bare soil)
Rubble C1  Bare soil beneath trees C3

Successional status (early/ intermediate/ advanced/ (mature))

TREES >5m (cover, number, dbh, height, age if cored, regeneration)
Abies lasiocarpa C4 ± 75 trees 8-29 cm dbh 5-16m high up to 190 years dense
(29 cm dbh tree cored 40 cm above ground – 185 rings counted + 5 allowance for height ± 190 years)
Picea engelmannii C3 ± 35 trees 8-61 cm dbh 5-17m high up to 285 years moderate
(61 cm dbh tree cored 50 cm above ground – 276 rings counted + 10 allowance for height ± 285 years)
Pinus albicaulis C2 6 trees 11-42 cm dbh 6-11m high up to 220 years moderate
(42 cm dbh tree cored 40 cm above ground – 210 rings counted + 10 allowance for height ± 220 years)

TALL SHRUBS 2-5m (cover, abundance, phenology)
Abies lasiocarpa C1 A5 shoot growth 2-4 cm
Picea engelmannii C1 A3 shoot growth 1-3 cm

LOW SHRUBS 0.5-2m (cover, abundance, phenology)
Abies lasiocarpa C2 A7 (phenology as above)
Picea engelmannii + A2 (phenology as above)

DWARF SHRUBS <0.5m (cover, abundance, phenology)
Vaccinium myrtillus C3 A12 vegetative, shoot growth 1-3 cm
Abies lasiocarpa + A6 (phenology as above)
Potentilla fruticosa + A2 flowering, shoot growth 1-2 cm

HERBS (cover, abundance, height, phenology)
Antennaria pulcherrima + A6 to 20 cm flowering
Arnica latifolia C1 A10 to 45 cm flowering
Astragalus bourgovii + A2 to 10 cm flowering
Bromus pumpellianus + A3 to 40 cm flowering
Calamagrostis canadensis + A3 to 40 cm flowering
Campanula rotundifolia + A1 20 cm with flower buds
Carex concinnoides + A5 to 20 cm flowering
Carex rossii + A6 to 5 cm in fruit
Castilleja flavescens C1 A7 to 50 cm in flower and fruit
Delphinium glaucum + A2 to 30 cm flowering
Epilobium angustifolium + A4 to 20 cm vegetative stems
Erigeron peregrinus C2 A12 to 45 cm flowering
Erigeron philadelphicus + A2 to 30 cm flowering
Festuca scabrella + A3 (tussocks) to 70 cm flowering
Fragaria virginiana C1 A8 to 15 cm with flower buds
Galium boreale + A5 to 12 cm vegetative stems
Gentianella amarella + A2 to 10 cm flowering
Geum rossii + A2 to 10 cm flowering
Hedysarum sulphurescens + A5 to 30 cm in fruit
Hieracium albiflorum + A2 to 10 cm flowering
Juncus drummondii + A2 to 10 cm flowering
Lupinus argenteus + A2 to 10 cm flowering
Mertensia paniculata + A2 to 10 cm flowering
Osmorhiza depauperata + A4 to 15 cm in fruit
Pedicularis bracteosa C1 A8 to 45 cm in fruit
Penstemon confertus + A6 to 30 cm flowering
Pinguicula vulgaris + A2 to 10 cm flowering
Polygonum bistortoides + A2 to 10 cm flowering
Potentilla diversifolia + A5 to 30 cm flowering
Pyrola secunda + A2 vegetative
Ranunculus eschscholtzii + A4 to 10 cm in fruit
Rumex acetosella + A2 to 10 cm flowering
Saxifraga bronchialis + A2 to 10 cm flowering
Senecio fremontii + A2 to 10 cm flowering
Senecio lugens C1 A7 to 40 cm flowering
Senecio triangularis + A2 to 10 cm flowering
Silene parryi + A3 to 30 cm with flower buds
Solidago multiradiata C1 A9 to 40 cm flowering
Stellaria longipes + A2 to 10 cm flowering
Swertia perennis + A2 to 10 cm flowering
Taraxacum officinale + A2 to 10 cm flowering
Thalictrum occidentale + A2 to 10 cm flowering
Trisetum spicatum C1 A8 to 40 cm flowering
Valeriana sitchensis C2 A10 to 55 cm flowering
Veratrum viride + A2 to 10 cm flowering
Veronica cardiifolia C1 A8 to 40 cm flowering
Viola adunca + A2 to 10 cm flowering
Agoseris glauca + A6 to 25 cm with flower buds
Achillea millefolium + A6 basal leaves only
Hedysarum sulphurescens + A5 to 30 cm in fruit
Galium boreale + A5 to 12 cm vegetative stems
Carex concinnoides + A5 to 20 cm flowering
Festuca scabrella + A3 (tussocks) to 70 cm flowering
Osmorhiza depauperata + A4 to 15 cm in fruit
Ranunculus eschscholtzii + A4 to 10 cm in fruit
Epilobium angustifolium + A4 to 20 cm vegetative stems
Silene parryi + A3 to 30 cm with flower buds
Pyrola secunda + A2 vegetative
Zygadenus elegans + A2 basal leaves only
Campanula rotundifolia + A1 20 cm with flower buds

| Cover Scale | |
|---|---|
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| Abundance Scale | |
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(in terms of stems distinct at ground level, unless otherwise stated)

MOSSES AND LICHENS (cover)
Mosses C2 (on shaded ground and rotting wood): Tortula norvegica, Mnium arizonicum, Brachythecium starkei and Bryum cf. stenotrichum identified in samples.
Peltigera aphthosa + Cladonia + (on rotting wood) Crustose lichens + (on dead wood and tree bark)

EPIPHYTES (common/ frequent/ scarce/ rare) Bryoria, Fistulariella and Usnea on old trees

OTHER COMMENTS
Density of trees in this forest very variable, with herbaceous openings and dense patches of trees mosaically distributed.
Other plants noted in this stand outside the quadrat: Arenaria capillaris, Senecio triangularis and Astragalus bourgovii.

G. C. Griffiths

PLATEAU MOUNTAIN SURVEY

# STAND DESCRIPTION

Vegetation Type: Subalpine juniper-bearberry scrub Sample No.: 14 Location: NW 34-14-4-W5 on border of W3-15-4-W5 Date: 14th August 1982
Elevation: 6600 ft. Slope: 45-65% Aspect: SW Quadrat Sizes: 10 m
Landform & Topography: Poorly stabilized talus slope, rubbly

Drainage Class: rapid Hygrotope: xeric
Soil: Orthic Regosol (0-10 cm dark brown to blackish Ah mixed with rubble, without distinct B layer)
Ground cover other than vegetation (e.g. rocks, water, deadfall, bare soil)
Rubble C2
Successional status (early/ intermediate/ advanced/ (mature))
TREES >5m (cover, number, dbh, height, age if cored, regeneration)

NONE

TALL SHRUBS 2-5m (cover, abundance, phenology)

NONE

LOW SHRUBS 0.5-2m (cover, abundance, phenology)

NONE

DWARF SHRUBS <0.5m (cover, abundance, phenology)

Arctostaphylos uva-ursi ssp. stipitata C6 mats in fruit, shoot growth 1-3 cm
Juniperus communis C2 A6 (bushes) in fruit, shoot growth 1-4 cm
Juniperus horizontalis C2 mats in fruit, shoot growth 2-4 cm
Potentilla fruticosa + A7 in flower and fruit, shoot growth 1-3 cm
Dryas octopetala ssp. hookeriana + mat in fruit
Picea engelmannii + A1 shoot growth 1-2 cm

HERBS (cover, abundance, height, phenology)

Hedysarum sulphurescens C2 A10 to 35cm in fruit
Lupinus lepidus C2 A10 to 55cm flowering
Aster alpinus C1 A10 to 25cm in fruit
Solidago decumbens C1 A9 to 20cm at peak of flowering
Senecio elegans C1 A8 to 20cm in flower and fruit
Gentiana propinqua C1 A8 to 10cm at peak of flowering
Aster sibiricus C1 A8 to 20cm flowering
Linum lewisii C1 A8 to 10cm in fruit
Chamaenerion latifolium C1 A7 to 45cm flowering
Festuca scabrella + A5(tussocks) to 55cm flowering
Allium cernuum + A7 to 30cm in flower and fruit
Campanula rotundifolia + A7 to 25cm in flower and fruit
Potentilla diversifolia + A7 to 10cm in fruit
Galium boreale + A7 to 20cm flowering
Selaginella densa + mats prostrate
Carex rupestris + A7 to 5cm in fruit
Minuartia austromontana + A7 2-3cm in fruit
Antennaria umbrinella + mats to 20cm in fruit
Minuartia obtusiloba + A6 to 5cm in fruit
Minuartia rubella + A6 to 5cm in fruit
Anemone multifida + A5 to 25cm in fruit
Arnica alpina + A5 to 15cm in fruit
Oxytropis cusickii + A5 to 20cm in fruit
Solidago multiradiata + A5 to 25cm flowering
Potentilla ovina + A5 basal leaves only
Saxifraga bronchialis + A3(mats) to 20cm in fruit
Hedysarum mackenzii + A4 to 30cm flowering
Gentiana amarella + A4 to 7cm flowering
Erigeron ochroleucus + A3 to 15cm flowering
Draba borealis + A2 to 15cm in fruit
Koeleria cristata + A2 20cm flowering
Kobresia myosuroides + A2 15cm in fruit
Festuca idahoensis + A2 40cm flowering
Anemone patens + A2 to 25cm in fruit
Cerastium arvense + A2 vegetative
Zizia aptera + A1 basal leaves only

MOSSES AND LICHENS (cover)

Mosses rare (+), a few cushions on rocks
Lichens scarce (+), yellow-green crustose lichens occasional on soil and rocks, also Xanthoria on rocks

EPIPHYTES (common/ frequent/ scarce/ rare) NONE

OTHER COMMENTS

Other plants noted in this stand outside the quadrat: Senecio streptanthifolius, Geum triflorum, Townsendia parryi and Sedum lanceolatum.

This habitat is colonized by occasional trees of Pinus albicaulis and Picea engelmannii.

Cover Scale

| | |
|---|---|
| + | <1% |
| 1 | 1-5% |
| 2 | 6-15% |
| 3 | 16-25% |
| 4 | 26-50% |
| 5 | 51-75% |
| 6 | 76-85% |
| 7 | 86-95% |
| 8 | 96-100% |

Abundance Scale

| | |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3-4 |
| 4 | 5-8 |
| 5 | 9-16 |
| 6 | 17-32 |
| 7 | 33-64 |
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(in terms of stems distinct at ground level, unless otherwise stated)

PLATEAU MOUNTAIN SURVEY

# STAND DESCRIPTION

Vegetation Type: *Talus tundra* Sample No.: *15* Location: *cirque NE 5-15-4-W5* Date: *15th August 1982*

Elevation: *7400 ft.* Slope: *35-40%* Aspect: *ENE* Quadrat Sizes: *10m*

Landform & Topography: *Partly stabilized talus slope, rubbly*

Drainage Class: *well* Hygrotope: *mesic*

Soil: *Orthic Regosol (0-5 cm medium- to dark-brown Ah above rubble, without distinct B Layer)*

Ground cover other than vegetation (e.g. rocks, water, deadfall, bare soil)
*Rubble and blocks C2*

Successional status (early/ intermediate/ advanced/ (mature))

TREES >5m (cover, number, dbh, height, age if cored, regeneration)

*NONE*

TALL SHRUBS 2-5m (cover. abundance, phenology)

*NONE*

LOW SHRUBS 0.5-2m (cover, abundance, phenology)

*NONE*

DWARF SHRUBS <0.5m (cover. abundance, phenology)

*Dryas octopetala ssp. hookeriana C4 mats in fruit*
*Potentilla fruticosa C2 A7 (bushes) in flower and fruit, shoot growth up to 3 cm*
*Salix glauca + A2 (bushes) in fruit, shoot growth 2-5 cm*

HERBS (cover, abundance, height, phenology)

*Hedysarum sulphurescens C3 A12 to 25cm in fruit*
*Achillea millefolium C2 A14 to 20cm flowering*
*Agropyron latiglume C2 A13 to 40cm flowering*
*Myosotis alpestris C2 A13 to 15cm in fruit*
*Festuca scabrella C1 A7 (tussocks) to 70cm flowering*
*Bromus pumpellianus C1 A12 to 50cm flowering*
*Poa rupicola C1 A11 to 30cm flowering*
*Poa buttersoaii C1 A11 to 40cm flowering*
*Potentilla diversifolia C1 A10 to 20cm in fruit*
*Penstemon procerus C1 A10 to 15cm flowering*
*Fragaria virginiana C1 A10 to 10cm flowering*
*Erustium arvense C1 A10 to 15cm in fruit*
*Valium boreale C1 A10 to 20cm flowering*
*Polemonium pulcherrimum C1 A9 to 15cm in fruit*
*Androsace chamaejasme C1 A9 to 7cm in fruit*
*Gentiana amarella C1 A9 to 7cm flowering*
*Solidago multiradiata C1 A8 to 15cm flowering*
*Senecio lugens C1 A8 to 20cm flowering*
*Poa alpina C1 A8 to 35 cm flowering*
*Poa interior C1 A6 (tussocks) to 25cm flowering*
*Anemone multifida C1 A7 to 20 cm in fruit*
*Besseya cinerea + A7 to 15cm in fruit*
*Astragalus alpinus + A6 to 25cm in fruit*
*Carex atrosquama + A5 to 40cm in fruit*
*Minuartia obtusiloba + A5 to 6cm in flower and fruit*
*Smelowskia calycina + A5 to 15cm in fruit*
*Stellaria monantha + A5 to 4cm flowering*
*Gentiana propinqua + A5 to 5cm flowering*
*Sedum lanceolatum + A4 to 10cm flowering*
*Minuartia rubella + A4 3cm in fruit*
*Luzula spicata + A4 to 20cm in fruit*
*Phacelia sericea + A2 to 15cm in fruit*
*Draba incerta + A2 to 10cm in fruit*
*Arabis drummondii + A2 to 25cm in fruit*
*Androsace septentrionalis + A2 to 5cm in fruit*
*Agoseris glauca + A1 basal leaves only*

MOSSES AND LICHENS (cover)

*Mosses and lichens scarce on soil (+)*
*Xanthoria on rocks (+)*

EPIPHYTES (common/ frequent/ scarce/ rare) *NONE*

OTHER COMMENTS

*Other plants noted in this stand outside the quadrat: Epilobium latifolium, Silene acaulis and Saxifraga bronchialis*

| Cover Scale | |
|---|---|
| + | <1% |
| 1 | 1-5% |
| 2 | 6-15% |
| 3 | 16-25% |
| 4 | 26-50% |
| 5 | 51-75% |
| 6 | 76-85% |
| 7 | 86-95% |
| 8 | 96-100% |

| Abundance Scale | |
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| 1 | 1 |
| 2 | 2 |
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(in terms of stems distinct at ground level, unless otherwise noted)

PLATEAU MOUNTAIN SURVEY

# STAND DESCRIPTION

Vegetation Type: Subalpine juniper-bearberry scrub Sample No.: 16 Location: SE4-15-4-W5 Date: 15th August 1982
Elevation: 6900 ft. Slope: 20-30% Aspect: S Quadrat Sizes: 15m for tall/low shrubs, 10m for others
Landform & Topography: Saprolite slope, rolling

Drainage Class: rapid Hygrotope: xeric
Soil: Orthic Regosol/Orthic Eutric Brunisol (2cm blackish Ah, 0-10 cm medium- to yellow-brown Bm) over saprolite

Ground cover other than vegetation (e.g. rocks, water, deadfall, bare soil)
Rubble C+

Successional status (early/ intermediate/ advanced/ (mature))

TREES >5m (cover, number, dbh, height, age if cored, regeneration)

NONE

TALL SHRUBS 2-5m (cover, abundance, phenology)
Pinus albicaulis C1 A3 shoot growth up to 15 cm

LOW SHRUBS 0.5-2m (cover, abundance, phenology)
Pinus albicaulis + A1 (phenology as above)
Picea engelmannii + A1 shoot growth 5 cm

DWARF SHRUBS <0.5m (cover, abundance, phenology)
Arctostaphylos uva-ursi ssp. stipitata C6 mats in fruit, shoot growth up to 3 cm
Juniperus horizontalis C3 mats in fruit, shoot growth up to 4 cm
Juniperus communis C1 A5(bushes) in fruit, shoot growth up to 4 cm
Dryas octopetala ssp. hookeriana + 1 mat in fruit

HERBS (cover, abundance, height, phenology)
Antennaria pulchella C2 A12 to 35cm in fruit
Astragalus aboriginum C2 A12 to 70cm flowering
Festuca scabrella C2 A9(tussocks) to 75cm flowering
Agropyron pumpellianum C1 A12 to 50cm flowering
Achillea millefolium C1 A10 to 35cm flowering
Calamagrostis purpurascens C1 A9 to 30cm flowering
Galium boreale C1 A9 to 15cm flowering
Agoseris glauca C1 A7 to 25cm flowering
Allium cernuum C1 A7 to 25cm in flower and fruit
Anemone multifida C1 A7 to 30cm in fruit
Senecio canus C1 A7 to 20cm flowering
Aster alpinus + A7 to 20cm in fruit
Gentiana propinqua + A7 to 6cm flowering
Astragalus aboriginum + A6 to 20cm in fruit
Arnica alpina + A6 to 25cm in fruit
Solidago multiradiata + A5 to 18cm flowering
Sedum lanceolatum + A5 to 15cm in flower and fruit
Anemone patens + A5 to 25cm in fruit
Potentilla ovina + A5 to 25cm in fruit
Koeleria cristata + A5 to 30cm flowering
Castilleja occidentalis + A5 to 25cm flowering
Swalowskia calycina + A4 to 15cm in fruit
Aster sibiricus + A4 to 10cm flowering
Androsace chamaejasme + A4 to 7cm in fruit
Campanula rotundifolia + A4 to 20cm flowering
Besseya cinerea + A4 to 15cm in fruit
Gentiana amarella + A4 to 6cm flowering
Selaginella densa + 1 mat prostrate
Minuartia obtusiloba + A1 10cm in fruit
Minuartia rubella + A1 7cm in fruit

MOSSES AND LICHENS (cover)
Crustose lichens occasional on rocks (+)
No mosses

EPIPHYTES (common/ frequent/ scarce/ rare) NONE

OTHER COMMENTS
Seedlings of Populus trichocarpa occur in this habitat, but no trees of this species. Scattered lodgepole pines (Pinus contorta) occur, as well as Pinus albicaulis.
Other plants noted in this stand outside the quadrat: Erigeron ochroleucus, Townsendia parryi, Solidago decumbens and Astragalus aboriginum.

| Cover Scale | |
|---|---|
| + | <1% |
| 1 | 1-5% |
| 2 | 6-15% |
| 3 | 16-25% |
| 4 | 26-50% |
| 5 | 51-75% |
| 6 | 76-85% |
| 7 | 86-95% |
| 8 | 96-100% |

| Abundance Scale | |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3-4 |
| 4 | 5-8 |
| 5 | 9-16 |
| 6 | 17-32 |
| 7 | 33-64 |
| 8 | 65-128 |
| 9 | 129-256 |
| 10 | 257-512 |
| 11 | 513-1024 |
| 12 | 1025-2048 |
| 13 | 2049-4096 |
| 14 | 4097-8192 |
| 15 | 8193-16384 |
| 16 | 16385-32768 |

(in terms of stems distinct at ground level, unless otherwise stated)

PLATEAU MOUNTAIN SURVEY

# STAND DESCRIPTION

**Vegetation Type:** Dryas tundra **Sample No.:** 17 **Location:** NE4-15-4-W5 **Date:** 16th August 1982
**Elevation:** 7100 feet **Slope:** ± level **Aspect:** - **Quadrat Sizes:** 10m
**Landform & Topography:** Limestone pavement (Mississippian, Livingstone Formation), scoured by glacial flow (with striae pointing ENE), with crevices up to 50 cm deep
**Drainage Class:** rapid **Hygrotope:** xeric
**Soil:** shallow patches of at most a few cm of humus ("nonsoil")
**Ground cover other than vegetation (e.g. rocks, water, deadfall, bare soil)**
Bedrock C5
**Successional status (early/ intermediate/ advanced/ (mature))**
**TREES >5m (cover, number, dbh, height, age if cored, regeneration)**

NONE

**TALL SHRUBS 2-5m (cover. abundance, phenology)**

NONE

**LOW SHRUBS 0.5-2m (cover, abundance, phenology)**

NONE

**DWARF SHRUBS <0.5m (cover. abundance, phenology)**

| | | | |
|---|---|---|---|
| Dryas octopetala ssp. hookeriana | C4 | mats | in fruit |
| Potentilla fruticosa | C2 | A9 | in fruit, shoot growth 1-4 cm |
| Juniperus communis | C1 | A2(bushes) | in fruit, shoot growth 1-2 cm |
| Picea engelmannii | + | A3 | in crevices only, shoot growth 1-3 cm |
| Salix glauca | + | 1 bush | in fruit, shoot growth 2-3 cm |

**HERBS (cover, abundance, height, phenology)**

| | | | |
|---|---|---|---|
| Androsace chamaejasme | C1 | A12 | to 4 cm in fruit |
| Valeria cristata | C1 | A11 | to 40cm in fruit |
| Bromus pumpellianus | C1 | A9 | to 55 cm in fruit |
| Selaginella densa | C1 | mats | prostrate, in crevices only |
| Hedysarum elegans | C1 | A9 | to 30 cm in fruit |
| Hierochloe alpinus | C1 | A9 | to 15 cm in fruit |
| Carex scirpoidea | C1 | A9 | to 20cm in fruit, mostly in crevices |
| Festuca scabrella | C1 | A6(tussocks) | to 70 cm flowering |
| Gentiana amarella | C1 | A8 | to 7 cm flowering |
| Solidago multiradiata | C1 | A8 | to 20 cm flowering |
| Hedysarum sulphurescens | C1 | A7 | to 35cm in fruit |
| Anemone patens | C1 | A7 | to 15cm fruit dispersed |
| Anemone multifida | C1 | A7 | to 25cm fruit dispersed |
| Campanula rotundifolia | + | A7 | to 25cm flowering (in crevices) |
| Aster sibiricus | + | A7 | to 15cm flowering (mostly in crevices) |
| Minuartia obtusiloba | + | A7 | to 6 cm in fruit |
| Carex interior | + | A5(tussocks) | to 17cm flowering |
| Potentilla ovina | + | A6 | to 20cm in fruit |
| Helictotrichon hookeri | + | A6 | to 40 cm flowering |
| Smelowskia calycina | + | A6 | to 8cm seeds dispersed |
| Oxytropis cusickii | + | A5 | to 15cm in fruit |
| Erigeron ochroleucus | + | A5 | to 15cm flowering |
| Kobresia myosuroides | + | A5 | to 17cm in fruit |
| Arnica alpina | + | A5 | to 20cm in fruit |
| Hedysarum mackenzii | + | A4 | to 25cm in fruit |
| Antennaria umbrinella | + | mats | to 10 cm flowering |
| Cystopteris fragilis | + | A2 | 7cm in crevices |
| Potentilla diversifolia | + | A1 | basal leaves in crevice |
| Besseya cinerea | + | A1 | 7cm seeds dispersed |
| Sedum lanceolatum | + | A1 | 2 cm vegetative |
| Castilleja occidentalis | + | A1 | 15cm in fruit |

**MOSSES AND LICHENS (cover)**

Mosses scarce, mainly in crevices (+)

Cladonia + (beneath Potentilla fruticosa) Crustose lichens occasional on rock (+), including Xanthoria and dark forms

**EPIPHYTES (common/ frequent/ scarce/ rare)** NONE

**OTHER COMMENTS**

This pavement supports in places strips or patches of Pinus albicaulis, Picea engelmannii and Abies lasiocarpa (either as erect trees or as krummholz).

Other plants noted in this stand outside the quadrat: Arctostaphylos uva-ursi, Polygonum viviparum, Astragalus aboriginum, Sedum rosea, Townsendia parryi and Senecio canus.

| Cover Scale | |
|---|---|
| + | <1% |
| 1 | 1-5% |
| 2 | 6-15% |
| 3 | 16-25% |
| 4 | 26-50% |
| 5 | 51-75% |
| 6 | 76-85% |
| 7 | 86-95% |
| 8 | 96-100% |

| Abundance Scale | |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3-4 |
| 4 | 5-8 |
| 5 | 9-16 |
| 6 | 17-32 |
| 7 | 33-64 |
| 8 | 65-128 |
| 9 | 129-256 |
| 10 | 257-512 |
| 11 | 513-1024 |
| 12 | 1025-2048 |
| 13 | 2049-4096 |
| 14 | 4097-8192 |
| 15 | 8193-16384 |
| 16 | 16385-32768 |

(in terms of stems distinct at ground level, unless otherwise noted)

PLATEAU MOUNTAIN SURVEY

# STAND DESCRIPTION

SE3-15-4-W5 on
Location: border of NE33-14-4-W5 Date: 16th August 1982
Sample No.: 18
Vegetation Type: Riverine fescue grassland
Quadrat Sizes: 15m for tall/low shrubs, 10m for others
Elevation: 6600 ft. Slope: ± level Aspect: –
Landform & Topography: Alluvial bench beside intermittent creek, terraced
Drainage Class: moderately well Hygrotope: Subxeric in late summer (but subhygric earlier in season)
Soil: Orthic Black Chernozem (± 3 cm fibrous medium-brown organic layer, ± 15 cm blackish Ah, ± 15 cm medium-brown Bm) over alluvial gravel
Ground cover other than vegetation (e.g. rocks, water, deadfall, bare soil)
NONE
Successional status (early/ intermediate/ advanced/ (mature))
TREES > 5m (cover, number, dbh, height, age if cored, regeneration)

NONE

TALL SHRUBS 2-5m (cover, abundance, phenology)

NONE

LOW SHRUBS 0.5-2m (cover, abundance, phenology)
Potentilla fruticosa C2 A6 (bushes) in flower and fruit, shoot growth up to 5 cm

DWARF SHRUBS < 0.5m (cover, abundance, phenology)
Potentilla fruticosa C1 A8 (bushes) (phenology as above)

HERBS (cover, abundance, height, phenology)

Festuca scabrella C3 A10 (tussocks) to 125 cm flowering
Carex microptera C2 A13 to 25 cm in fruit
Carex praticola C2 A13 to 30 cm in fruit
Penstemon confertus C2 A13 to 30 cm in fruit
Geum triflorum C2 A12 to 35 cm in fruit
Aster foliaceus C2 A12 to 40 cm flowering
Potentilla gracilis C2 A11 to 50 cm flowering
Penstemon procerus C1 A12 to 25 cm in fruit
Solidago multiradiata C1 A12 to 25 cm in flower and fruit
Achillea millefolium C1 A12 to 35 cm flowering
Fragaria virginiana C1 A12 to 10 cm vegetative
Kobresia myosuroides C1 A12 to 25 cm in fruit
Poa alpina C1 A11 to 45 cm in fruit
Danthonia intermedia C1 A11 to 20 cm in flower and fruit
Potentilla diversifolia C1 A10 to 45 cm in fruit
Carex gymnoclada C1 A10 to 25 cm in fruit
Lupinus pumpellianus C1 A10 to 50 cm in flower and fruit
Delphinium boreale C1 A10 to 20 cm with flower buds
Poa pratensis C1 A9 to 20 cm flowering
Festuca saximontana C1 A8 to 40 cm flowering
Agropyron trachycaulum var. majus C1 A8 to 70 cm flowering
Ranunculus cardiophyllus C1 A7 to 40 cm in fruit
Gentiana amarella + A7 to 15 cm flowering
Draba aurea + A6 to 30 cm in fruit
Phleum commutatum + A6 to 25 cm flowering
Valeriana dioica + A5 to 40 cm in fruit
Campanula rotundifolia + A5 to 20 cm flowering
Rumex albestris + A5 to 45 cm in fruit
Trisetum spicatum + A5 to 25 cm in fruit
Antennaria umbrinella + mats to 18 cm in fruit
Antennaria pulcherrima + A5 to 30 cm flowering
Allium schoenoprasum + A4 to 40 cm flowering
Carex atrosquama + A4 to 20 cm in fruit
Beseya cinerea + A3 to 15 cm in fruit
Cerastium arvense + A2 to 25 cm in fruit
Geum macrophyllum + A1 45 cm in fruit
Arabis drummondii + A1 30 cm in fruit
Agoseris glauca + A1 basal leaves only

MOSSES AND LICHENS (cover)

NONE

EPIPHYTES (common/ frequent/ scarce/ rare) NONE

OTHER COMMENTS

This stand is to some extent transitional to shrubby cinquefoil carr as indicated by the prominence of Potentilla fruticosa.

Also noted in this stand outside the quadrat: Senecio pauperculus.

Cover Scale

| | |
|---|---|
| + | < 1% |
| 1 | 1-5% |
| 2 | 6-15% |
| 3 | 16-25% |
| 4 | 26-50% |
| 5 | 51-75% |
| 6 | 76-85% |
| 7 | 86-95% |
| 8 | 96-100% |

Abundance Scale

| | |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3-4 |
| 4 | 5-8 |
| 5 | 9-16 |
| 6 | 17-32 |
| 7 | 33-64 |
| 8 | 65-128 |
| 9 | 129-256 |
| 10 | 257-512 |
| 11 | 513-1024 |
| 12 | 1025-2048 |
| 13 | 2049-4096 |
| 14 | 4097-8192 |
| 15 | 8193-16384 |
| 16 | 16385-32768 |

(in terms of stems divided or ground level, unless otherwise noted)

PLATEAU MOUNTAIN SURVEY

# STAND DESCRIPTION

Vegetation Type: Shrubby Cinquefoil Carr  Sample No.: 19  Location: Upper Livingstone Valley NE28-14-6-W5  Date: 16th August 1982
Elevation: 6300 ft  Slope: ±level  Aspect: -  Quadrat Sizes: 15m for tall/low shrubs, 10m for others
Landform & Topography: Alluvial/morainal valley floor (veneer of till and/or alluvium over bedrock)
Drainage Class: moderately well  Hygrotope: mesic in late summer (but subhygric earlier in season)
Soil: Rego Black Chernozem (5-10cm medium-brown organic layer, silty 10-15cm blackish brown Ah, medium-brown Bm 0-5cm) over gravel
Ground cover other than vegetation (e.g. rocks, water, deadfall, bare soil) Conifers C1
Successional status (early/ intermediate/ advanced/ (mature))
TREES >5m (cover, number, dbh, height, age if cored, regeneration)

NONE

TALL SHRUBS 2-5m (cover. abundance, phenology)

NONE

LOW SHRUBS 0.5-2m (cover, abundance, phenology)
Potentilla fruticosa C4 A9(bushes) in flower and fruit, shoot growth 2-4 cm
Salix glauca C3 A8(bushes) in fruit, shoot growth 2-8 cm
Betula glandulosa + A4(bushes) in fruit, shoot growth 2-5 cm

DWARF SHRUBS <0.5m (cover. abundance, phenology)
Potentilla fruticosa C2 A9(bushes) shoot growth up to 15 cm
Salix glauca C1 A7(bushes) shoot growth up to 20 cm

HERBS (cover, abundance, height, phenology)
Anemone patens C3 A14 to 35cm flowering
Fragaria virginiana C2 A14 to 15cm vegetative
Aster foliaceus C2 A12 to 45cm flowering
Danthonia intermedia C2 A11 to 30cm flowering
Carex microptera C1 A12 to 25cm in fruit
Festuca scabrella C1 A7(tussocks) to 70cm flowering
Solidago multiradiata C1 A12 to 25cm flowering
Gentiana amarella C1 A12 to 18cm flowering
Lupinus boltiscus var. montanus C1 A12 to 20cm flowering
Bromus pumpellianus C1 A11 to 55cm flowering
Koeleria cristata C1 A11 to 20cm flowering
Achillea millefolium C1 A11 to 30cm flowering
Carex praticola C1 A10 to 25cm in fruit
Bromus Thalycaulon var. majus C1 A10 to 50cm flowering
Geum triflorum C1 A9 to 40cm in fruit
Thalictrum occidentale C1 A9 to 50cm in fruit (in shrub thickets only)
Pentstemon confertus C1 A9 to 20cm in fruit
Lupinus immaculatus C1 A9 to 50cm flowering
Valeriana dioica C1 A9 to 45cm in fruit
Senecio pauperculus C1 A8 to 35cm flowering
Poa glauca C1 A8 to 60cm flowering
Geum macrophyllum C1 A7 to 60cm in fruit
Potentilla gracilis C1 A6 to 45cm flowering
Kobresia myosuroides + A7 to 20cm in fruit
Cerastium arvense + A7 to 25cm in fruit
Phleum commutatum + A7 to 25cm flowering
Potentilla diversifolia + A6 to 40cm in fruit
Poa alpina + A6 to 35cm in fruit
Galium boreale + A6 to 20cm vegetative
Campanula rotundifolia + A5 to 35cm flowering
Antennaria pulcherrima + A5 to 15cm flowering
Penstemon procerus + A5 to 20cm flowering
Vicia americana + A5 to 60cm flowering (among shrubs)
Zizia aptera + A4 basal leaves only
Taraxacum officinale + A2 basal leaves only
Antennaria rosea + mats vegetative
Rumex alpestris + A1 40cm in fruit

MOSSES AND LICHENS (cover)

NONE

EPIPHYTES (common/ frequent/ scarce/ rare) NONE
OTHER COMMENTS

This is the only plant community within the Candidate Ecological Reserve heavily grazed by cattle.

Isolated trees of Picea engelmannii and Pinus contorta occur in this habitat.

| Cover Scale | |
|---|---|
| + | <1% |
| 1 | 1-5% |
| 2 | 6-15% |
| 3 | 16-25% |
| 4 | 26-50% |
| 5 | 51-75% |
| 6 | 76-85% |
| 7 | 86-95% |
| 8 | 96-100% |

| Abundance Scale | |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3-4 |
| 4 | 5-8 |
| 5 | 9-16 |
| 6 | 17-32 |
| 7 | 33-64 |
| 8 | 65-128 |
| 9 | 129-256 |
| 10 | 257-512 |
| 11 | 513-1024 |
| 12 | 1025-2048 |
| 13 | 2049-4096 |
| 14 | 4097-8192 |
| 15 | 8193-16384 |
| 16 | 16385-32768 |

(- those of stems counted at ground level, unless otherwise stated)

PLATEAU MOUNTAIN SURVEY

# STAND DESCRIPTION

Vegetation Type: Subalpine spruce-fir forest Sample No.: 20 Location: NE33-14-4-W5 Date: 17th August 1982
Elevation: 6600 feet Slope: 40-70% (steeper upslope) Aspect: N Quadrat Sizes: 20m for trees, 15m for tall/low shrubs, 10m for others
Landform & Topography: Stable saprolite slope above creek, ± uniform
Drainage Class: well Hygrotope: mesic
Soil: Orthic Humic Regosol (5cm dark brown humus, 20 cm blackish Ah, no B layer) over rubble
Ground cover other than vegetation (e.g. rocks, water, deadfall, bare soil)
Rubble C1 Bare soil beneath trees C2
Successional status (early/ intermediate/ advanced/ (mature))
TREES >5m (cover, number, dbh, height, age if cored, regeneration)
Picea engelmannii C4 ± 80 trees 8-44 cm dbh 5-20m high up to 200 years dense
(44 cm dbh tree cored 60 cm above ground - 186 rings counted + 15 allowance for height = 200 years)
Abies lasiocarpa C3 ± 80 trees 8-24 cm dbh 5-18m high — dense

TALL SHRUBS 2-5m (cover, abundance, phenology)
Abies lasiocarpa C2 A7 shoot growth up to 4 cm
Picea engelmannii C2 A6 shoot growth up to 4 cm

LOW SHRUBS 0.5-2m (cover, abundance, phenology)
Abies lasiocarpa C2 A7 (phenology as above)
Picea engelmannii C2 A7 (phenology as above)
Salix vestita C1 A8 catkins shedding seed, shoot growth up to 5 cm
Salix glauca C1 A7 in fruit, shoot growth up to 6 cm
Salix barrattiana C1 A7 seed shed, shoot growth up to 6 cm
Menziesia glabella + 1 bush shoot growth 8 cm
Pinus albicaulis + A1 shoot growth 1 cm

DWARF SHRUBS <0.5m (cover, abundance, phenology)
Phyllodoce glandaliflora C3 mats in fruit, shoot growth up to 4 cm
Vaccinium myrtillus C2 A12 vegetative, shoot growth up to 3 cm
Abies lasiocarpa C1 A10 (phenology as above)
Picea engelmannii C1 A9 (phenology as above)
Salix vestita C1 A9 (phenology as above)
Salix glauca C1 A6 (phenology as above)
Vaccinium scoparium + A8 vegetative, shoot growth 2-3 cm
Cassiope tetragona + A8 vegetative, shoot growth 1 cm
Salix nivalis + A7 in fruit, shoot growth up to 2 cm
Salix barrattiana + A5 (phenology as above)
Dryas octopetala ssp. hookeriana + mats vegetative
Rhododendron albiflorum + A1 vegetative, shoot growth 5 cm

HERBS (cover, abundance, height, phenology)
Pyrola secunda C1 A12 to 15cm with flowers and flowerbuds
Carex concinnoides C1 A12 to 15cm in fruit
Pedicularis bracteosa C1 A11 to 45cm in fruit
Senecio triangularis C1 A11 to 40cm flowering
Pyrola minor C1 A11 to 12cm with flowers and flowerbuds
Anemone parviflora C1 A10 to 30cm in fruit
Polygonum viviparum C1 A10 to 25cm in fruit
Parnassia fimbriata C1 A9 to 35cm flowering
Erigeron peregrinus C1 A8 to 50cm flowering
Stenanthium occidentale C1 A8 to 30cm flowering
Luzula parviflora C1 A8 to 45cm flowering
Juncus biglumis C1 A8 to 10cm flowering
Valeriana sitchensis C1 A7 to 50cm flowering
Castilleja miniata + A6 to 30cm flowering
Senecio lugens + A6 to 30cm flowering
Aquilegia flavescens + A6 to 50cm flowering
Solidago multiradiata + A5 to 15cm flowering
Potentilla diversifolia + A5 to 20cm in fruit
Trollius albiflorus + A5 to 40cm in fruit
Equisetum variegatum + A4 vegetative
Gramineae sp. indet + A4 basal leaves only
Antennaria racemosa + A1 basal leaves only
Antennaria lanata + A1 basal leaves only
Sibbaldia procumbens + A1 vegetative

MOSSES AND LICHENS (cover)
Mosses C6: Hylocomium splendens, Pohlia nutans, Timmia austriaca, Drepanocladus uncinatus, Brachythecium groenlandicum and Dicranum scoparium identified in samples.
Peltigera aphthosa C2 Cladonia on decaying wood (C1)

EPIPHYTES (common/ frequent/ scarce/ rare) Bryoria, Fistulariella and Usnea on older trees; also crustose and foliose lichens on bark.
OTHER COMMENTS

The composition of this stand appears stable, with alpine fir remaining subdominant to Engelmann spruce on account of its shorter lifespan.

| Cover Scale | |
|---|---|
| + | <1% |
| 1 | 1-5% |
| 2 | 6-15% |
| 3 | 16-25% |
| 4 | 26-50% |
| 5 | 51-75% |
| 6 | 76-85% |
| 7 | 86-95% |
| 8 | 96-100% |

| Abundance Scale | |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3-4 |
| 4 | 5-8 |
| 5 | 9-16 |
| 6 | 17-32 |
| 7 | 33-64 |
| 8 | 65-128 |
| 9 | 129-256 |
| 10 | 257-512 |
| 11 | 513-1024 |
| 12 | 1025-2048 |
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(in terms of stems distinct at ground level, unless otherwise noted)

ATEAU MOUNTAIN SURVEY

# STAND DESCRIPTION

Vegetation Type: Lower subalpine lodgepole pine forest  Sample No.: 21  Location: Upper Livingstone Valley NE33-14-4-W5  Date: 17th August 1982

Elevation: 6500 ft.  Slope: 35-45%  Aspect: SW  Quadrat Sizes: 20m for trees, 15m for tall low shrubs, 10m for others

Landform & Topography: Morainal slope (veneer of rubbly till over saprolite), uniform

Drainage Class: well  Hygrotope: subxeric

Soil: Orthic Eutric Brunisol (2cm dark Ah over yellow-brown Bm of variable depth, mostly 10-20 cm) over rubble

Ground cover other than vegetation (e.g. rocks, water, deadfall, bare soil)
Bare soil beneath trees C2  Deadfalls C1  Blocks +

Successional status (early/ (intermediate)/ advanced/ mature)

TREES >5m (cover, number, dbh, height, age if cored, regeneration)

Pinus contorta var. latifolia C7 ±120 trees 7-27 cm dbh 10-20 m high up to 108 years sparse
(27 cm dbh tree cored 40 cm above ground - 103 rings counted + 5 allowance for height ≈ 108 years)

Picea engelmannii + 1 tree 11 cm dbh 12 m high — moderate

TALL SHRUBS 2-5m (cover, abundance, phenology)

Picea engelmannii + A1 shoot growth 5 cm

LOW SHRUBS 0.5-2m (cover, abundance, phenology)

Shepherdia canadensis C3 A8 (bushes) in fruit, shoot growth up to 10 cm
Picea engelmannii + A3 (phenology as above)
Abies lasiocarpa + A3 shoot growth up to 12 cm

DWARF SHRUBS <0.5m (cover, abundance, phenology)

Linnaea borealis C4 mats in flower
Juniperus communis C1 A4 (bushes) in fruit, shoot growth 1-2 cm
Vaccinium myrtillus C1 A8 vegetative, shoot growth 2-3 cm
Shepherdia canadensis + A6 shoot growth up to 5 cm
Abies lasiocarpa + A5 shoot growth up to 6 cm
Rosa acicularis + A6 vegetative, shoot growth up to 5 cm
Pinus albicaulis + A3 shoot growth up to 3 cm
Pinus contorta var. latifolia + A1 shoot growth 2 cm

HERBS (cover, abundance, height, phenology)

Arnica cordifolia C2 A12 to 35 cm in flower and fruit
Pyrola secunda C2 A14 to 10 cm with flower buds
Elymus innovatus C2 A12 to 70 cm mostly vegetative, a few flowering
Carex Concinnoides C2 A12 to 15 cm in fruit
Hedysarum sulphurescens C1 A10 to 45 cm in fruit
Fragaria virginiana C1 A10 to 15 cm mostly vegetative, a few in fruit
Epilobium angustifolium C1 A8 to 30 cm in fruit
Aster foliaceus C1 A8 to 20 cm mostly vegetative, a few with flower buds
Allium cernuum C1 A8 to 35 cm flowering
Pyrola chlorantha C1 A8 to 20 cm flowering
Galium boreale C1 A8 to 15 cm vegetative stems
Solidago multiradiata C1 A7 to 20 cm mostly vegetative, a few flowering
Senecio pauperculus C1 A7 to 35 cm mostly vegetative, a few flowering
Anemone multifida C1 A7 to 35 cm in fruit
Gentiana amarella + A7 to 6 cm flowering
Agoseris glauca + A6 to 25 cm flowering
Castilleja miniata + A5 to 55 cm flowering
Antennaria racemosa + A5 to 25 cm flowering
Epilobium angustifolium + A4 to 25 cm vegetative stems
Campanula rotundifolia + A4 to 25 cm in flower and fruit
Potentilla diversifolia + A1 basal leaves only
Androsace chamaejasme + A1 10 cm in fruit

MOSSES AND LICHENS (cover)

Mosses C2  Cladonia +  Crustose lichens on blocks +

EPIPHYTES (common/ frequent/ (scarce)/ rare) Fistulorella and Bryoria on older trees

OTHER COMMENTS

Also noted in this stand outside the quadrat were the shrubs Potentilla fruticosa, Salix glauca and Vaccinium scoparium.

While eventual succession to spruce-fir forest will occur, the process appears very slow at this site, probably requiring over 200 years.

Lycopodium

| Cover Scale | |
|---|---|
| + | <1% |
| 1 | 1-5% |
| 2 | 6-15% |
| 3 | 16-25% |
| 4 | 26-50% |
| 5 | 51-75% |
| 6 | 76-85% |
| 7 | 86-95% |
| 8 | 96-100% |

| Abundance Scale | |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3-4 |
| 4 | 5-8 |
| 5 | 9-16 |
| 6 | 17-32 |
| 7 | 33-64 |
| 8 | 65-128 |
| 9 | 129-256 |
| 10 | 257-512 |
| 11 | 513-1024 |
| 12 | 1025-2048 |
| 13 | 2049-4096 |
| 14 | 4097-8192 |
| 15 | 8193-16384 |
| 16 | 16385-32768 |

(= stems of trees dbh at ground level, unless otherwise stated)

PLATEAU MOUNTAIN SURVEY

# STAND DESCRIPTION

**Vegetation Type:** Alpine heath **Sample No.:** 22 **Location:** NW31-14-4-W5 **Date:** 18th August 19
**Elevation:** 7100 ft. **Slope:** 5-20% **Aspect:** E **Quadrat Sizes:** 10m
**Landform & Topography:** Saprolite slope, rolling to benched, mildly cryoturbated

**Drainage Class:** well **Hygrotope:** mesic
**Soil:** Orthic Regosol (5-10cm dark brown turfy Ah over saprolite and bedrock, without B Layer)
**Ground cover other than vegetation (e.g. rocks, water, deadfall, bare soil)** Bedrock and rubble C2
**Successional status (early/ intermediate/ advanced/ (mature))**
**TREES >5m (cover, number, dbh, height, age if cored, regeneration)**

NONE

**TALL SHRUBS 2-5m (cover. abundance, phenology)**

NONE

**LOW SHRUBS 0.5-2m (cover, abundance, phenology)**

NONE

**DWARF SHRUBS <0.5m (cover. abundance, phenology)**

| | | | |
|---|---|---|---|
| Phyllodoce glanduliflora | C6 | mats | in fruit |
| Salix nivalis | C2 | mats | in fruit |
| Picea engelmannii | + | A1 | shoot growth 2 cm |

**HERBS (cover, abundance, height, phenology)**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Antennaria lanata | C2 | A12 | to 20 cm | in fruit | Minuartia sajanensis | + | A5 to 4cm in fruit |
| Erigeron peregrinus | C1 | A9 | to 25cm | flowering | Poa alpina | + | A5 to 20 cm flowering |
| Solidago multiradiata | C1 | A9 | to 17 cm | flowering | Carex albonigra | + | A4 to 15cm in fruit |
| Selaginella densa | C1 | mats | prostrate | | Polygonum viviparum | + | A4 to 10cm in flower and fruit |
| Potentilla diversifolia | C1 | A8 | to 25cm | in fruit | Castilleja occidentalis | + | A4 to 17cm flowering |
| Erigeron aureus | C1 | A8 | to 10cm | in flower and fruit | Senecio lugens | + | A2 to 25cm in fruit |
| Poa rupicola | C1 | A8 | to 25cm | flowering | Luzula spicata | + | A1 15cm in fruit |
| Festuca scabrella | C1 | A5(tussocks) | to 50cm | flowering | | | |
| Poa pattersonii | C1 | A7 | to 25cm | flowering | | | |
| Carex gynocleada | C1 | A7 | to 10cm | in fruit | | | |
| Arenaria capillaris | + | A7 | to 10cm | past peak of flowering | | | |
| Sedum lanceolatum | + | A7 | to 10cm | flowering | | | |
| Obbaldia procumbens | + | A7 | to 6cm | in fruit | | | |
| Festuca brachyphylla | + | A7 | to 20cm | flowering | | | |
| Carex haydeniana | + | A6 | to 15cm | in fruit | | | |
| Carex microptera | + | A6 | to 15cm | in fruit | | | |
| Agoseris glauca | + | A5 | to 15cm | flowering | | | |

**MOSSES AND LICHENS (cover)**

Cetraria C3 Cladonia and foliose lichens on soil C1
Mosses scarce (+)

**EPIPHYTES (common/ frequent/ scarce/ rare)** NONE

**OTHER COMMENTS**

Other plants noted in this stand outside the quadrat: Pedicularis groenlandica, Silene acaulis, Rumex alpestris, Penstemon procerus, Cerastium arvense, Saxifraga occidentalis, Antennaria umbrinella, Smelowskia calycina and Sedum rosea; also the lichens Stereocaulon and Thamnolia.

Dryas octopetala ssp. hookeriana colonizes dry rocky and raised areas in this habitat. Occasional stunted trees (Picea engelmannii, Abies lasiocarpa and Larix lyallii) also occur.

**Cover Scale**

| | |
|---|---|
| + | <1% |
| 1 | 1-5% |
| 2 | 6-15% |
| 3 | 16-25% |
| 4 | 26-50% |
| 5 | 51-75% |
| 6 | 76-85% |
| 7 | 86-95% |
| 8 | 96-100% |

**Abundance Scale**

| | |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3-4 |
| 4 | 5-8 |
| 5 | 9-16 |
| 6 | 17-32 |
| 7 | 33-64 |
| 8 | 65-128 |
| 9 | 129-256 |
| 10 | 257-512 |
| 11 | 513-1024 |
| 12 | 1025-2048 |
| 13 | 2049-4096 |
| 14 | 4097-8192 |
| 15 | 8193-16384 |
| 16 | 16385-32768 |

(- [illegible] unless otherwise stated)

PLATEAU MOUNTAIN SURVEY

# STAND DESCRIPTION

**Vegetation Type:** Willow-dwarf birch carr **Sample No.:** 23 **Location:** Salter Pass SW20-15-4-W5 **Date:** 19th August 1982

**Elevation:** 6050 ft. **Slope:** 5-10% **Aspect:** W **Quadrat Sizes:** 15 m for tall/low shrubs, 10 m for others

**Landform & Topography:** Stabilized alluvial deposit on valley floor, ± uniform

**Drainage Class:** imperfect **Hygrotope:** subhygric

**Soil:** Orthic Eutric Brunisol (2-3 cm blackish brown Ah, ± 1 cm grey-brown Ae, 20-35 cm Bm medium-brown becoming yellow-brown with depth) over gravel

**Ground cover other than vegetation (e.g. rocks, water, deadfall, bare soil)** Boulders Ct

**Successional status (early/ intermediate/ advanced/ (mature))**

**TREES >5m (cover, number, dbh, height, age if cored, regeneration)**

NONE

**TALL SHRUBS 2-5m (cover. abundance, phenology)**

NONE

**LOW SHRUBS 0.5-2m (cover, abundance, phenology)**

Salix glauca C4 A10 (bushes) in fruit, shoot growth up to 20 cm
Betula glandulosa C4 A10 (bushes) in fruit, shoot growth up to 15 cm
Salix farrae C2 A8 (bushes) catkins shed, shoot growth up to 20 cm
Potentilla fruticosa + A6 (bushes) in fruit, shoot growth up to 15 cm
Picea glauca/engelmannii + A5 shoot growth up to 4 cm

**DWARF SHRUBS <0.5m (cover. abundance, phenology)**

Potentilla fruticosa + A7 shoot growth 2-5 cm
Juniperus horizontalis + A3 vegetative, shoot growth 1-2 cm
Arctostaphylos uva-ursi + A1 vegetative, shoot growth 2 cm

**HERBS (cover, abundance, height, phenology)**

Elymus innovatus C7 A15 to 75 cm mostly vegetative, a few flowering
Astragalus americanus C2 A12 to 50 cm in fruit
Fragaria virginiana C2 A12 vegetative
Festuca idahoensis C2 A12 to 50 cm flowering
Bromus interior C1 A9 (mostly) to 30 cm flowering
Carex atratiformis ssp. raynoldsii C1 A11 to 35 cm in fruit
Aster foliaceus C1 A11 to 30 cm flowering
Achillea millefolium C1 A10 to 40 cm flowering
Potentilla diversifolia C1 A10 to 45 cm in fruit
Valeriana dioica C1 A9 basal leaves only (among shrubs)
Poa pratensis C1 A9 to 30 cm flowering
Poa alpina C1 A8 to 30 cm in fruit
Poa grayana C1 A7 to 55 cm flowering
Senecio pauperculus C1 A7 to 35 cm in fruit
Solidago multiradiata C1 A7 to 30 cm in fruit
Gentiana amarella + A7 to 10 cm flowering
Penstemon confertus + A7 to 25 cm in fruit
Galium boreale + A7 to 30 cm with flower buds
Androsace chamaejasme + A7 to 10 cm in fruit
Agropyron trachycaulum var. unajus + A6 to 60 cm flowering
Agropyron subsecundum + A6 to 40 cm flowering
Potentilla gracilis + A5 to 25 cm with flower buds
Astragalus alpinus + A5 vegetative
Anemone multifida + A4 to 40 cm in fruit
Carex concinnoides + A4 to 15 cm in fruit
Taraxacum officinale + A1 basal leaves only
Vicia americana + A1 60 cm flowering
Pyrola asarifolia + A1 basal leaves only
Campanula rotundifolia + A1 25 cm flowering

**MOSSES AND LICHENS (cover)**

Mosses and lichens scarce (+), mainly on boulders

**EPIPHYTES (common/ frequent/ scarce/ rare)** NONE

**OTHER COMMENTS**

Other plants in this stand but outside the quadrat: Senecio lugens, Hedysarum sulphurescens, Oxytropis monticola ssp. montiola and Delphinium glaucum.

This community intergrades with gravel bar scrub in Salter Pass. The habitat is colonized by scattered spruce (Picea glauca, P. engelmannii and intergrades) and poplar (Populus trichocarpa).

| Cover Scale | |
|---|---|
| + | < 1% |
| 1 | 1-5% |
| 2 | 6-15% |
| 3 | 16-25% |
| 4 | 26-50% |
| 5 | 51-75% |
| 6 | 76-85% |
| 7 | 86-95% |
| 8 | 96-100% |

| Abundance Scale | |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3-4 |
| 4 | 5-8 |
| 5 | 9-16 |
| 6 | 17-32 |
| 7 | 33-64 |
| 8 | 65-128 |
| 9 | 129-256 |
| 10 | 257-512 |
| 11 | 513-1024 |
| 12 | 1025-2048 |
| 13 | 2049-4096 |
| 14 | 4097-8192 |
| 15 | 8193-16384 |
| 16 | 16385-32768 |

(in terms of stems, clumps or ground level, unless otherwise stated)

PLATEAU MOUNTAIN SURVEY

# STAND DESCRIPTION

**Vegetation Type:** Mixed pine open forest **Sample No.:** 24 **Location:** Salter Pass NE19-15-4-W5 **Date:** 19th August 1982

**Elevation:** 6200 ft. **Slope:** 45-50% **Aspect:** SSW **Quadrat Sizes:** 20m for trees, 15m for tall/low shrubs, 10m for others

**Landform & Topography:** Saprolite slope above creek, ± uniform, rubbly

**Drainage Class:** rapid **Hygrotope:** xeric

**Soil:** Orthic Eutric Brunisol (1-5 cm dark Ah, up to 15 cm yellow-brown Bm mixed with rubble)

**Ground cover other than vegetation (e.g. rocks, water, deadfall, bare soil)**
Rubble and bedrock C3 Bare soil beneath trees C1 Deadfalls +

**Successional status (early/ intermediate/ advanced/ (mature))**

**TREES >5m (cover, number, dbh, height, age if cored, regeneration)**

| | | | | | |
|---|---|---|---|---|---|
| Pinus contorta var. latifolia | C2 | 15 trees | 8-35 cm dbh | 5-15m high | — moderate |
| Pinus albicaulis | C1 | 5 trees | 8-20 cm dbh | 5-10 m high | — moderate |
| Pinus flexilis | C1 | 3 trees | 25-38 cm dbh | 10-15 m high | up to 420 years moderate |

(25 cm dbh tree cored 70 cm above ground – 146 rings counted + 5-8 allowance for rotten centre + 10 allowance for height = 163 years: larger trees hollow in centre, but allowing 1 cm gain in radius over 40 years the age of the 38 cm dbh tree can be estimated at 420 years).

Picea engelmannii + 1 tree 34 cm dbh 15m high — sparse

**TALL SHRUBS 2-5m (cover, abundance, phenology)**

Populus tremuloides C1 A4 shoot growth up to 5 cm
Populus trichocarpa C1 A4 shoot growth up to 10 cm
Pinus contorta var. latifolia + A3 shoot growth up to 5 cm
Pinus flexilis/albicaulis + A2 shoot growth up to 3 cm (saplings of these species not distinguished)

**LOW SHRUBS 0.5-2m (cover, abundance, phenology)**

Populus tremuloides C2 A8 (phenology as above)
Potentilla fruticosa C2 A8 (bushes) in fruit
Shepherdia canadensis C2 A7 (bushes) in fruit
Pinus contorta var. latifolia C1 A5 (phenology as above)
Populus trichocarpa + A4 (phenology as above)
Picea engelmannii + A4 shoot growth up to 12 cm
Pinus flexilis/albicaulis + A3 (phenology as above)
Abies lasiocarpa + A2 shoot growth 2-4 cm

**DWARF SHRUBS <0.5m (cover, abundance, phenology)**

Arctostaphylos uva-ursi C1 mats in fruit, shoot growth 1-5 cm
Juniperus communis C1 A4 (bushes) in fruit, shoot growth up to 4 cm
Juniperus horizontalis C1 mats in fruit, shoot growth up to 3 cm
Rosa acicularis C1 A10 to 15 cm tall, shoot growth 2-6 cm
Amelanchier alnifolia + A7 vegetative, new growth up to 2 cm
Populus tremuloides + A5 shoot growth up to 5 cm
Populus trichocarpa + A2 shoot growth up to 5 cm

**HERBS (cover, abundance, height, phenology)**

| | | | | |
|---|---|---|---|---|
| Elymus innovatus | C2 | A12 | to 65 cm | mostly vegetative, a few flowering |
| Aster sibiricus | C1 | A11 | to 30 cm | flowering |
| Solidago decumbens | C1 | A10 | to 25 cm | flowering |
| Hulsia aristata | C1 | A10 | to 45 cm | in flower and fruit |
| Agoseris glauca | C1 | A10 | to 20 cm | in flower and fruit |
| Galium boreale | C1 | A10 | to 30 cm | flowering |
| Hedysarum sulphurescens | C1 | A9 | to 40 cm | past flowering |
| Senecio canus | C1 | A9 | to 25 cm | flowering |
| Anemone multifida | C1 | A9 | to 40 cm | in fruit |
| Aster foliaceus | C1 | A8 | basal leaves only | |
| Allium cernuum | C1 | A8 | to 25 cm | in flower and fruit |
| Androsace chamaejasme | C1 | A8 | to 8 cm | in fruit |
| Calamagrostis purpurascens | C1 | A7 | to 40 cm | flowering |
| Campanula rotundifolia | + | A7 | to 30 cm | flowering |
| Cerastium arvense | + | A6 | to 15 cm | in fruit |
| Achillea millefolium | + | A6 | to 25 cm | flowering |

Arnica lonchophylla + A6 to 30 cm in fruit
Aster alpinus + A6 to 20 cm in fruit
Clematis verticellaris + A4 to 150 cm (on trees) in fruit
Minuartia rubella + A4 to 5 cm in fruit
Carex sp. indet. + A4 basal leaves only
Castilleja occidentalis + A3 to 20 cm flowering
Saxifraga branchialis + A3 to 15 cm in fruit
Sedum lanceolatum + A3 to 8 cm in fruit
Senecio streptanthifolius + A1 to 25 cm in flower

**MOSSES AND LICHENS (cover)**

Mosses scarce (+), mostly on deadfalls or at bases of tree trunks
No lichens on soil

**EPIPHYTES (common/ frequent/ scarce/ (rare))** Crustose and foliose lichens on old trees (mainly towards their bases)

**OTHER COMMENTS**

Also noted in this stand outside the quadrat: Spiraea betulifolia, Aster conspicuus and Linnaea borealis.

| Cover Scale | |
|---|---|
| + | <1% |
| 1 | 1-5% |
| 2 | 6-15% |
| 3 | 16-25% |
| 4 | 26-50% |
| 5 | 51-75% |
| 6 | 76-85% |
| 7 | 86-95% |
| 8 | 96-100% |

| Abundance Scale | |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3-4 |
| 4 | 5-8 |
| 5 | 9-16 |
| 6 | 17-32 |
| 7 | 33-64 |
| 8 | 65-128 |
| 9 | 129-256 |
| 10 | 257-512 |
| 11 | 513-1024 |
| 12 | 1025-2048 |
| 13 | 2049-4096 |
| 14 | 4097-8192 |
| 15 | 8193-16384 |
| 16 | 16385-32768 |

(in terms of stems dbh or ground level, unless otherwise stated)

PLATEAU MOUNTAIN SURVEY

# STAND DESCRIPTION

Vegetation Type: Gravel bar scrub  Sample No.: 25  Location: NE19-15-4-W5 Salter Pass  Date: 19th August 1982
Elevation: 5900 ft.  Slope: 5%  Aspect: NW  Quadrat Sizes: 15m for tall/low shrubs, 10m for others
Landform & Topography: Unstable alluvial gravel in dry creek valley, channelled

Drainage Class: moderately well  Hygrotope: subxeric after spring flood
Soil: Orthic Regosol (at most 5cm yellowish silty A4 over gravel)

Ground cover other than vegetation (e.g. rocks, water, deadfall, bare soil)
Silt and gravel C4

Successional status (early/ intermediate/ advanced/ (mature))

TREES >5m (cover, number, dbh, height, age if cored, regeneration)

NONE

TALL SHRUBS 2-5m (cover. abundance, phenology)

NONE

LOW SHRUBS 0.5-2m (cover, abundance, phenology)
Salix drummondiana C1 A4(bushes) shoot growth up to 15 cm
Picea glauca/engelmannii C1 A5 shoot growth up to 15 cm
Populus trichocarpa C1 A4 shoot growth up to 20 cm
Potentilla fruticosa + 1 bush in fruit, shoot growth up to 6 cm

DWARF SHRUBS <0.5m (cover. abundance, phenology)
Dryas drummondii C3 mats in fruit
Picea glauca/engelmannii + A4 shoot growth up to 6 cm
Salix glauca + A2 shoot growth 2 cm
Populus trichocarpa + A1 shoot growth 10 cm
Shepherdia canadensis + A1 shoot growth 2-4 cm
Juniperus communis + A1 shoot growth 1-3 cm

HERBS (cover, abundance, height, phenology)
Hedysarum sulphurescens C1 A9 to 40cm in fruit
Poa alpina C1 A9 to 25cm in fruit
Castilleja occidentalis C1 AB to 30cm in fruit
Senecio canus C1 AB to 30cm in flower
Cerastium arvense C1 A9 to 18cm in fruit
Festuca baffinensis C1 A9 to 10cm in fruit
Festuca brachyphylla C1 AB to 17cm in fruit
Senecio streptanthifolius C1 A7 to 25cm flowering
Elymus latiglume + A7 to 30cm in fruit
Campanula rotundifolia + A7 to 20cm in fruit
Androsace chamaejasme + A6 to 10cm in fruit
Elymus innovatus + A5 to 55cm flowering
Lemonium pulcherrimum + A5 to 25cm in fruit
Minuartia rubella + A5 to 5cm in fruit
Agoseris glauca + A4 to 20cm in fruit
Artemisia campestris + A4 to 25cm flowering
Astragalus aboriginum + A3 to 20cm in fruit
Oxytropis oxyphylla + A3 to 20cm in fruit
Solidago decumbens + A3 basal leaves only
Anemone multifida + A3 to 45cm in fruit
Artemisia michauxiana + A3 to 15cm vegetative
Koeleria cristata + A2 to 25cm in fruit
Antennaria umbrinella + 1mat 10cm in fruit
Achillea millefolium + A1 vegetative
Trisetum spicatum + A1 30cm flowering
Gentiana amarella + A1 15cm flowering

MOSSES AND LICHENS (cover)
Mosses scarce (+), a few cushions in protected sites
Lichens scarce on rocks (+)

EPIPHYTES (common/ frequent/ scarce/ rare) NONE

OTHER COMMENTS
Also noted in this stand outside the quadrat were: Arctostaphylos uva-ursi, Oxytropis monticola ssp. monticola and Zygadenus elegans.
Young spruce seedlings are common in this community. Succession to riverine forest is presumably prevented by occasional catastrophic flooding and gravel movement.

Cover Scale

| | |
|---|---|
| + | <1% |
| 1 | 1-5% |
| 2 | 6-15% |
| 3 | 16-25% |
| 4 | 26-50% |
| 5 | 51-75% |
| 6 | 76-85% |
| 7 | 86-95% |
| 8 | 96-100% |

Abundance Scale

| | |
|---|---|
| 1 | 1 |
| 2 | 2 |
| 3 | 3-4 |
| 4 | 5-8 |
| 5 | 9-16 |
| 6 | 17-32 |
| 7 | 33-64 |
| 8 | 65-128 |
| 9 | 129-256 |
| 10 | 257-512 |
| 11 | 513-1024 |
| 12 | 1025-2048 |
| 13 | 2049-4096 |
| 14 | 4097-8192 |
| 15 | 8193-16384 |
| 16 | 16385-32768 |

(in terms of stems distinct at ground level, unless otherwise stated)

## APPENDIX 2. ANNOTATED LIST OF VASCULAR PLANTS

Bird (1979) has listed 88 species of lichens and 48 species of bryophytes from the alpine zone of Plateau Mountain. In the present study these non-vascular plants were considered only when they had significant coverage within communities. Records have been given for many quadrats in Appendix 1. A list of bryophytes for the saxifrage-moss community has also been given in the text (section 3.28). The following are records of bryophytes (identified by Dr. D. G. Horton) additional to Bird's list:

Barbilophozia lycopodioides (Wallr.) Loeske (quadrat 2), Dicranum brevifolium (Lindb.) Lindb. var. brevifolium (quadrat 3), Pohlia nutans (Hedw.) Lindb. (quadrats 2 & 20), Bryum weigelii Spreng. (section 3.28), B. stenotrichum Müll. (quadrats 7 & 13), Mnium arizonicum Amann (quadrat 13), Plagiomnium ellipticum (Brid.) Kop. (section 3.28), Timmia austriaca Hedw. (quadrats 2 & 20), Orthotrichum speciosum Nees (quadrat 12), Pseudoleskeella tectorum (Brid.) Kindb. (quadrat 12), Thuidium abietinum (Brid.) B.S.G. (quadrats 7 & 12), Amblystegium serpens (Hedw.) B.S.G. (section 3.28), Brachythecium starkei (Brid.) B.S.G. (quadrats 5 & 13), B. groenlandicum (Jens.) Schljak. (quadrat 20), B. turgidum (Hartm.) Kindb. (quadrat 7 and section 3.28) and Pleurozium schreberi (Brid.) Mitt. (quadrat 2, codominant feathermoss in spruce-fir forest, Fo).

The following list of vascular plants is based mainly on our own records in conjunction with Bird's (1979) list and inspection of specimens deposited in the Alberta Energy and Natural Resources herbarium by Natural Areas staff. A few arbitrary decisions have been made to omit records which seem improbable and for which no supporting specimens were at hand. Since this list refers to the whole of the Plateau Mountain Reserve, including subalpine and montane areas, it is naturally much longer (containing 265 species) than Bird's (1979) alpine list which contained only 130 species.

Selaginellaceae

| | |
|---|---|
| Selaginella densa Rydb. (= S. rupestris auctt.) | common on dry open ground (Td, Te, Tf, Tk, Sw; stands 12,14,16, 17,22) |

Equisetaceae

| | |
|---|---|
| Equisetum scirpoides Michx. | occasional in Fo (stand 2) |
| Equisetum pratense Ehrh. | noted once only (Fo, stand 2) |
| Equisetum variegatum Schleich. | noted only in stand 20 (north-facing Fo in NE33-14-4) |

Ophioglossaceae

| | |
|---|---|
| *Botrychium lunaria* (L.) Sw. | noted once on gravel bar along Dry Creek (NW30-14-4) |

Polypodiaceae

| | |
|---|---|
| *Cystopteris fragilis* (L.) Bernh. | frequent on cliffs, talus and pavement (Br,Bt,Td; stands 11,17) |
| *Woodsia oregana* Eat. | on Bird's (1979) alpine list |

Pinaceae

| | |
|---|---|
| *Juniperus communis* L. | common or subdominant in Sm,Sw (stands 2,14,16), frequent in Fl, Fp (stands 21,24), occasional in Ss (stand 10) |
| *Juniperus horizontalis* Moench | common or subdominant in Sm,Sw (stands 2,14,16), frequent in Fp (stand 24) |
| *Abies lasiocarpa* (Hook.) Nutt. | normally subdominant to *Picea engelmannii* in climax Fo,Fu,Fw (stands 2,3,5,13,20), occasionally as krummholz (Sk) |

(The reference by Harris & Brown (1978) to Douglas fir, *Pseudotsuga menziesii* (Mirb.) Franco, on Plateau Mountain is assumed to be in error for *Abies*).

| | |
|---|---|
| *Larix lyallii* Parl. | restricted to head of Larch Creek, where codominant in Fu (stand 5) |
| *Picea engelmannii* Parry | normally dominant in canopy of climax Fo,Fr,Fu,Fw (stands 2,3,5, 13,20), occasionally as krummholz (Sk) |
| *Picea glauca* (Moench) Voss | noted only along Salter Creek (Fr), where intergrading with *P. engelmannii* |
| *Pinus albicaulis* Engelm. | prominent or codominant in Fw,Fp (stands 13,24), also frequent in Ss,Sw (stands 10,14,16), occasionally as krummholz (Sk) |
| *Pinus flexilis* James | restricted to lower slopes of Mt. Burke, where prominent or codominant in Fp (stand 24) |
| *Pinus contorta* Dougl. var. *latifolia* Engelm. | seral dominant in Fl (stand 21), replaced as canopy dominant by *Picea engelmannii* in Fo and absent from oldest stands; also as climax codominant in Fp (stand 24), and common in lower reaches of Fw but not reaching treeline |

| | |
|---|---|
| Salicaceae | |
| *Populus tremuloides* Michx. | common in Sm (stand 1) and Fp (stand 24), mostly in stunted form below 5 m tall |
| *Populus trichocarpa* T.& G. | common as saplings in Fp,Sg (stands 24,25), occasional in Sw (stand 16), rarely reaching tree size |
| *Salix nivalis* Hook. | common in dry tundra (Td,Te,Tf,Tk; stands 8,12,22); also in stand 20 (north-facing Fo) and in saxifrage-moss community on moist cliffs |
| *Salix vestita* Pursh | frequent in stand 20 (north-facing Fo in NE33-14-4) and in krummholz (Sk) |
| *Salix arctica* Pall. | scarce, in moist places at high elevation |
| *Salix glauca* L. | the most abundant willow, codominant in Ma,Ms (stands 4,9,23), prominent in Tm,Mp (stands 7,19), also frequent in stand 20 (north-facing Fo) and in krummholz (Sk) |
| *Salix brachycarpa* Nutt. | on Bird's (1979) alpine list |
| *Salix farrae* Ball | only in Salter Pass (prominent in Ms, stand 23) |
| *Salix drummondiana* Barratt | on gravel (Sg, stand 25), mainly along Salter Creek and Dry Creek |
| *Salix barrattiana* Hook. | codominant with *S. glauca* in Ma at higher elevation (stand 9), also frequent in stand 20 (north-facing Fo in NE33-14-4) |
| Betulaceae | |
| *Betula glandulosa* Michx. | codominant in Ms (stand 23), frequent in Mp (stand 19) and Fu (stand 5) |
| Polygonaceae | |
| *Oxyria digyna* (L.) Hill | in moist places mainly at high elevation (including saxifrage-moss community on cliffs) |
| *Polygonum viviparum* L. | common in tundra (Td,Te,Tk,Tm; stands 7,8,12,17,22), also in stand 20 (north-facing Fo) and saxifrage-moss community on cliffs |
| *Rumex alpestris* (Scop.) Löve | frequent on mesic to moist open ground (Gr,Ma,Mp,Te,Tk,Tm,Tt; stands 4,6,7,9,12,16,19,22) |

Caryophyllaceae

| | |
|---|---|
| Arenaria capillaris Poir. ssp. americana Maguire | frequent in Te (stand 22), also in Fw (stand 13) |
| Cerastium arvense L. | common on open ground, especially in Ma,Sg,Sm,Tk,Tm,Tt (stands 1,4,6,7, 12,15,25), also in Fp (stand 24) and saxifrage-moss community on cliffs |
| Cerastium beeringianum Cham. & Schlecht. | on Bird's (1979) alpine list |
| Lychnis apetala L. | collected in alpine zone by L.Allen & P.McIsaac (22.vii.81) |
| Minuartia austromontana Wolf & Packer | occasional in dry tundra and scrub (Bt,Sw; stands 11,14) |
| Minuartia rubella (Wahlenb.) Graebn. | frequent on dry open ground (Bt,Sg, Ss,Sw,Tt; stands 10,11,14,15,16,25), also in Fp (stand 24) |
| Minuartia obtusiloba (Rydb.) House | frequent on dry open ground (Ss,Sw, Td,Tk; stands 8,10,12,14,16,17) |
| Minuartia sajanensis (Willd.) | confirmed only in Te (stand 22) |

(Minuartia dawsonensis (Britt.) Mattf. on Bird's (1979) list needs confirmation).

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|---|---|
| Silene acaulis L. | mainly on the plateau (Td,Te,Tf,Tt) |
| Silene parryi (Wats.) Hitchc. & Maguire | occasional in Ma (stand 9) and forest openings (Fw, stand 13) |
| Stellaria monantha Hult. | on talus slopes (Bt,Tt; stands 11,15) |

(S. longipes in sense of Bird's (1979) list probably refers to this species).

Ranunculaceae

| | |
|---|---|
| Anemone patens L. | frequent on dry open ground (Sm,Ss, Sw,Td,Tk,Tt; stands 1,6,10,12,14,17) |
| Anemone multifida Poir. | common on dry open ground and in dry forest (Fl,Fp,Sg,Sm,Ss,Sw,Td,Tt; stands 1,10,14-17,21,24,25) |
| Anemone drummondii Wats. | noted only in Td (stand 8) |
| Anemone parviflora Michx. | common in stand 20 (north-facing Fo in NE33-14-4), otherwise scarce |
| Aquilegia flavescens Wats. | on talus screes (Bt, stand 11), gravel (Dg) and in open woods (Fo, Fw; stands 2,13,20) |
| Clematis verticellaris DC. | noted only in Fp (stand 24) |
| Delphinium bicolor Nutt. | in Ma (stand 9) and moist Tt (stand 6) |
| Delphinium glaucum Wats. | occasional along Salter Creek (Ms,Sg) |

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|---|---|
| Ranunculus cardiophyllus Hook. | frequent in Gr (stand 18) |
| Ranunculus pedatifidus Smith | noted only in stand 9 (Ma) |
| Ranunculus eschscholtzii Schlecht. | occasional in Tm (stand 7) and moist forest (Fw, stand 13) |
| Ranunculus pygmaeus Wahlenb. | on Bird's (1979) alpine list |
| Thalictrum occidentale Gray | common in Ma,Mp (stands 4,9,19), occasional in moist Fo (stand 3) |
| Trollius albiflorus (Gray) Rydb. | indicative of wet ground in Ma (stand 9), also in north-facing Fo in NE33-14-4 (stand 20) |

Cruciferae

| | |
|---|---|
| Arabis drummondii Gray | occasional in Gr,Ma,Tt (stands 4,15, 18) |
| Arabis lyallii Wats. | on Bird's (1979) alpine list |
| Arabis lemmonii Wats. | collected in alpine zone by P.Lee (20.viii.79) |
| Descurainia sophia (L.) Webb | roadside weed on Bird's (1979) alpin list |
| Draba aurea M. Vahl | occasional in Gr,Ma,Sm,Ss,Tt (stands 1,4,6,9,10,18) |
| Draba borealis DC. | occasional in Ma,Sw,Tk,Tm (stands 4,7,12,14) |
| Draba incerta Payson | occasional on talus slopes (Bt,Tt; stands 11,15) |
| Draba oligosperma Hook. | on Bird's (1979) alpine list |
| Draba crassifolia Grah. | on the plateau (Tf) |
| Draba porsildii Mulligan | recorded for Plateau Mountain by Mulligan (1974) |
| Draba nivalis Liljebl. | collected in the alpine zone by L.Allen (22.vii.81) |

(It is unclear whether the entry in Bird's (1979) list refers to the true D. nivalis or to D. lonchocarpa Rydb. (= D. nivalis var. elongata Wats.)).

| | |
|---|---|
| Rorippa sp. | on shore of lake in NE5-15-4 (Md) |
| Smelowskia calycina (Steph.) Mey. | common on talus and dry tundra (Bt, Td,Tm; stands 7,8,11,17); occasional in Sw,Te,Tt (stands 15,16,22) |

Crassulaceae

| | |
|---|---|
| Sedum lanceolatum Torr. (= S. stenopetalum auctt.) | frequent in dry tundra,scrub and ope forest (Dg,Fp,Sm,Ss,Sw,Td,Te,Tk,Tt; stands 1,6,8,10,12,14-17,22,24) |

| | |
|---|---|
| Sedum rosea (L.) Scop. ssp. integrifolium (Raf.) Hult. | frequent on rocks, talus and dry tundra (Br,Bt,Td,Te,Tf,Tk; stands 11,12,17,22) |
| **Saxifragaceae** | |
| Heuchera flabellifolia Rydb. | on Bird's (1979) alpine list |
| Leptarrhena pyrolifolia (Don.) R.Br. | on Bird's (1979) alpine list |
| Parnassia fimbriata Konig. | local on moist ground (including saxifrage-moss community on cliffs), also common in stand 20 (north-facing Fo in NE33-14-4) |
| Parnassia kotzebuei Cham. | in saxifrage-moss community on moist cliffs (NE5-15-4) |
| Saxifraga oppositifolia L. | on the plateau only (Tf) |
| Saxifraga adscendens L. | in saxifrage-moss community on moist cliffs |
| Saxifraga cernua L. | on Bird's (1979) alpine list |
| Saxifraga lyallii Engl. | local in moist places (including saxifrage-moss community on cliffs) |
| Saxifraga occidentalis Wats. (Records of S. rhomboidea Greene probably also refer to this species). | occasional in tundra and scrub (Ss,Td, Te; stands 8,10,22) |
| Saxifraga caespitosa L. | on Bird's (1979) alpine list |
| Saxifraga bronchialis L. | common on dry rocks and stony ground (Br,Bt,Fp,Ss,Sw,Tf,Tt; stands 10,11, 14,15,24) |
| **Grossulariaceae** | |
| Ribes lacustre (Pers.) Poir. | occasional on talus slopes (Bt,Ss; stands 10,11), also in forest openings and on gravel (Dg) |
| **Rosaceae** | |
| Amelanchier alnifolia Nutt. | noted only in Fp (stand 24) |
| Dryas drummondii Richards. | dominant in Sg (stand 25) |
| Dryas octopetala L. ssp. hookeriana (Juz.) Hult. | dominant in Td (stands 8,17) and in certain phases of Tf, also prominent in dry Tt (stand 15) |
| Fragaria virginiana Duchesne | common on open ground up to lower alpine zone (Gr,Ma,Mp,Ms,Sm,Ss,Tt; stands 1,4,6,10,15,16,19,23), also in dry forest (Fl,Fw; stands 13,21) |
| Geum macrophyllum Willd. | frequent in Mp (stand 19), otherwise only in Gr (stand 18) |

Geum triflorum Pursh — common in Gr,Mp and moist Tt (stands 6,18,19), occasional in Sw (stand 14)

Potentilla fruticosa L. — dominant in Mp (stand 19) and common on open ground up to lower alpine zone (Bt,Gr,Fp,Ma,Ms,Sm,Td,Tk,Tt; stands 1,4,6,9,11,12,15,17,18,23,24)

Potentilla gracilis Dougl. — common on valley floors (Gr,Mp,Ms; stands 18,19,23)

Potentilla diversifolia Lehm. — common on open ground (Gr,Ma,Mp,Ms, Ss,Td,Te,Tk,Tm,Tt; stands 4,6-10,12,15, 18,19,22,23)

Potentilla ovina Macoun — frequent in dry tundra and barren (Bt, Td; stands 8,11,17), occasional in Sw (stands 14,16)

Potentilla nivea L. — common in Td (stand 8)

Potentilla hyparctica Malte — on the plateau (Tf)

Rosa acicularis Lindl. — as dwarf shrub in Bt,Fl,Fp (stands 11, 21,24)

Sibbaldia procumbens L. — frequent in Te (stand 22), occasional in Fu,Tm (stands 5,7)

Spiraea betulifolia Pall. — noted only in Fp (stand 24)

Leguminosae

Astragalus americanus (Hook.) Jones — common in Ms (stand 23)

Astragalus robbinsii (Oakes) Gray — common in Ma (stands 4,9)

Astragalus aboriginum Richards. — occasional in dry tundra and scrub (Td,Sg,Sw; stands 16,17,25)

Astragalus eucosmus Robins. — noted only in stand 10 (Ss)

Astragalus alpinus L. — frequent in Tt (stands 6,15), scarce in Ma,Ms (stands 9,23)

Astragalus bourgovii Gray — occasional on stony ground

Astragalus vexilliflexus Sheld. — occasional on talus screes (Bt, stand 11) and gravel (Dg)

Hedysarum mackenzii Richards. (= H. boreale auctt.) — occasional in dry tundra and scrub (Td,Tk,Sw; stands 12,14,17)

Hedysarum sulphurescens Rydb. — common in tundra,scrub and dry forest (Bt,Fl,Fo,Fp,Sg,Sm,Ss,Sw,Td,Tk,Tt; stands 1,2,3,8,10,11,12,14-17,21,24,25)

Oxytropis deflexa (Pall.) DC. — noted only on gravel in NW30-14-4 (Dg

| | |
|---|---|
| Oxytropis cusickii Greenm. | frequent in dry tundra and scrub (Sg, Sw,Td,Tf,Tk; stands 6,12,14,16,17,25) |
| (= O. campestris in sense of Bird's (1979) alpine list) | |
| Oxytropis monticola Gray ssp. monticola | occasional at lower elevation in Ds, Sg,Sm (stands 1,23,25) |
| Oxytropis splendens Dougl. | locally common in moist Tt (stand 6) and on disturbed gravel (Dg) |
| Oxytropis podocarpa Gray | common in Td on ridges (stand 8) |
| Vicia americana Muhl. | common at lower elevation in Mp,Sm (stands 1,19) |

Linaceae

| | |
|---|---|
| Linum lewisii Pursh | common in juniper-bearberry scrub (Sm,Sw; stands 1,14,16) |

Elaeagnaceae

| | |
|---|---|
| Shepherdia canadensis (L.) Nutt. | dominant in shrub layer of Fl (stand 21), also common in Fo,Fp,Fr,Ss (stands 2,3, 10,24) |

Onagraceae

| | |
|---|---|
| Epilobium angustifolium L. | common in Ha (stands 4,9), otherwise scarce |
| Epilobium latifolium L. | occasional on moist talus or gravel and in saxifrage-moss community on cliffs |
| Epilobium hornemannii Reichenb. | on moist ground at high elevation (including saxifrage-moss community) |
| Epilobium saximontanum Hausskn. | on Bird's (1979) alpine list |

Umbelliferae

| | |
|---|---|
| Angelica dawsonii Wats. | locally common in moist Fo (stand 3) |
| Heracleum lanatum Michx. | local on moist ground |
| Osmorhiza depauperata Philippi | occasional in moist forest (Fo,Fw; stands 3,13) |
| Zizia aptera (Gray) Fern. | scarce in Mp,Sw (stands 14,19) |

Cornaceae

| | |
|---|---|
| Cornus canadensis L. | frequent in dry Fo (stand 2) |

Ericaceae

| | |
|---|---|
| Arctostaphylos uva-ursi (L.) Spreng. | dominant in Sm,Ss,Sw (stands 1,10,14, 16), whence all samples belonged to ssp. stipitata Packer & Denford; occasional in Bt,Fp,Sg (stands 11,24,25) |
| Cassiope tetragona (L.) Don | on moist slopes in E31-14-4 and in stand 20 (north-facing Fo in NE33-14-4) |

| | |
|---|---|
| Menziesia glabella Gray | occasional in Fo (stands 2,3,20) |
| Phyllodoce glanduliflora (Hook.) Cov. | dominant in Te (stand 22), codominant in ground layer of Fu (stand 5) and of stand 20 (north-facing Fo in NE33-14-4) |
| Rhododendron albiflorum Hook. | occasional in Fo (stands 3,20) |
| Vaccinium myrtillus L. | common or dominant in ground layer of Fo (stands 2,3,20), more patchy in Fl,Fw (stands 13,21) |
| Vaccinium scoparium Leiberg | codominant in ground layer of Fu (stand 5), common in Fo (stands 2,3,20), more patchy in Fl (stand 21) |
| Moneses uniflora (L.) Gray | in cool Fo, especially north-facing (stands 2,20) |
| Pyrola asarifolia Michx. | noted once only (Ms. stand 23) |
| Pyrola chlorantha Sw. | frequent in Fl,Fo (stands 2,3,21) |
| Pyrola minor L. | noted only in stand 20 (north-facing Fo in NE33-14-4) |
| Pyrola secunda L. | common in Fl,Fo,Fw (stands 2,13,20,21) |

Primulaceae

| | |
|---|---|
| Androsace chamaejasme Host ssp. lehmanniana (Spreng.) Hult. | common in dry tundra, barren and open forest (Bt,Fp,Td,Tf,Tk,Tt; stands 6,11, 12,15,17,24), occasional in Ms,Ss,Sw (stands 10,14,16,23) |
| Androsace septentrionalis L. var. subumbellata Nels. | scarce, noted only in Sm,Tt (stands 1,15) |
| Dodecatheon conjugens Greene var. viscidum (Piper) Mason | locally frequent in Ma and moist Tt (stands 6,9) |

Gentianaceae

| | |
|---|---|
| Gentiana prostrata Haenke | common in Tm (stand 7), also noted in Tk (stand 12) |
| Gentiana propinqua Richards. | frequent in dry tundra and scrub (Sw, Tk,Tt; stands 12,14,15,16) |
| Gentiana amarella L. ssp. acuta (Michx.) Hult. | frequent with the preceding in Sw,Tt (stands 14,15,16), also in Fl,Mp,Ms, Sm,Td (stands 1,17,19,21,23) |

Polemoniaceae

| | |
|---|---|
| Polemonium pulcherrimum Hook. | common in Tt (stands 6,15), occasional in Dg,Ma,Sg (stands 9,25) |

Hydrophyllaceae

| | |
|---|---|
| Phacelia franklinii (R.Br.) Gray | on rodent diggings in Ma (stand 4) and as roadside weed |
| Phacelia sericea (Grah.) Gray | occasional on dry slopes (Ss,Tt; stands 10,15) and gravel (Dg) |

Boraginaceae

| | |
|---|---|
| Lyosotis alpestris Schmidt ssp. asiatica Vestergr. | common in tundra and subalpine herbaceous vegetation (Ma,Ss,Td,Tk,Tm,Tt; stands 4,6-10,12,15) |

Scrophulariaceae

| | |
|---|---|
| Besseya cinerea (Raf.) Pennell | frequent in tundra (Td,Tk,Tm,Tt; stands 6,7,8,12,15), noted also in Gr,Sw (stands 16,18) |
| Castilleja occidentalis Torr. | frequent in tundra (Td,Te,Tk,Tm,Tt; stands 6.7,8,12.17,22) and on gravel (Sg, stand 25), noted also in Fp,Ma (stands 9,24) |
| Castilleja miniata Dougl. | less common than preceding, noted in Fl.Fo.Ma,Sm,Ss (stands 1,9,10,20,21) |
| Pedicularis bracteosa Benth. | common in moist forest (Fo,Fw; stands 3,13,20) and Ma (stand 9) |
| Pedicularis flammea L. | collected in alpine zone by P. McIsaac (22.vii.61) |
| Pedicularis groenlandica Retz. | common on moist ground (Ma,Te,Tk,Tm; stands 7,9,12,22) |
| Penstemon ellipticus Coult. & Fisch. | frequent on unstable screes (Bt, stand 11) and on disturbed gravel (Dg) |
| Penstemon confertus Dougl. | common on open ground (Dg,Gr,Mp,Ms,Sm, Ss; stands 1,10,18,19,23) |
| Penstemon procerus Dougl. | common on open ground (Dg,Gr,Ma,Mp,Te, Tt; stands 4,6,15,16,19,22) |
| Rhinanthus crista-galli L. | noted only along Salter Creek |
| Veronica wormskjoldii Roem. & Schult. (= V. alpina auctt.) | scarce, noted only in Ma (stand 4) |

Rubiaceae

| | |
|---|---|
| Galium boreale L. | common in talus vegetation (Bt,Tt; stands 6,11,15), scrub (Sm,Ss,Sw; stands 1,10, 14,16), grassland (Gr, stand 18) and pine forest (Fl,Fp: stands 21,24); occasional in carr (Ma,Mp,Ms; stands 4, 19,23) |

Caprifoliaceae

| | |
|---|---|
| Linnaea borealis L. | common or dominant in dry forest (Fl,Fo, Fp,Fr; stands 2,21,24) |
| Lonicera involucrata (Rich.) Banks | in forest openings at lower elevation (Fo, stand 2) |
| Sambucus melanocarpa Gray | beside road in SE corner of reserve |

| | |
|---|---|
| Viburnum edule (Michx.) Raf. | occasional in Fo at lower elevation (stand 2) |
| **Valerianaceae** | |
| Valeriana dioica L. ssp. sylvatica (Soland.) Hey. | frequent in carr (Ma,Mp,Ms; stands 4,9, 19,23) and riverine grassland (Gr, stand 18) |
| Valeriana sitchensis Bong. | common in moist forest (Fo,Fw; stands 3,13,20) and Ma (stand 9) |
| **Campanulaceae** | |
| Campanula rotundifolia L. | frequent in dry scrub (Sm,Sw; stands 1, 14,16) and in stand 17 (Td on pavement); occasional in Bt,Fl.Fp,Gr,Mp,Sg (stands 11,18.19,21,24,25) |
| Campanula uniflora L. | in fellfield tundra (Tf) |
| **Compositae** | |
| Achillea millefolium L. | common on open ground up to lower alpine zone (Gr,Ma,Mp,Ms,Sm,Ss,Sw,Tk, Tm,Tt; stands 1,4,6,7,9,10,12,15,16,18, 19,23), occasional in forest |
| Agoseris glauca (Pursh) Raf. | frequent in wide range of communities up to lower alpine zone (especially Fl,Fp,Fw,Ma,Sm,Ss,Sw,Tk, moist Tt; stands 1,4,6,9,10,12.13,16,21,24) |
| Antennaria racemosa Hook. | common in moist Fo (stand 3), occasional in Fl (stand 21) |
| Antennaria pulcherrima (Hook.) Greene | common in Ss and moist Tt (stands 6,10), also noted in Fw,Gr,Mp (stands 13,18,19) |
| Antennaria lanata (Hook.) Greene | common in heath (Te, stand 22) and Fu (stand 5) |
| Antennaria media Greene | on Bird's (1979) alpine list as A. alpina (L.) Gaertn. var. media (Greene) Jepson |
| Antennaria umbrinella Rydb. | frequent in talus barren, tundra and subalpine scrub (Bt,Ss,Sw,Td,Te,Tt; stands 6,8,10,11,14,17,22) |
| Antennaria rosea Greene | frequent in Sm (stand 1), also noted in Mp (stand 19) |
| Arnica cordifolia Hook. | common in forest and seral scrub (Fl, Fo,Fw,Ss; stands 2,3,10,13,21) |
| Arnica latifolia Bong. | locally common in cool forest (Fo,Fu, Fw; stands 3.5,13,20) |
| Arnica diversifolia Greene | collected in alpine zone by P.Lee (20.viii.79) |

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|---|---|
| Arnica lonchophylla Greene | noted only in Fp (stand 24) |
| Arnica alpina (L.) Olin ssp. tomentosa (Macoun) Maguire | common in Td (stands 8,17), occasional in Sw (stands 14,16) |
| (Arnica fulgens Pursh on Bird's (1979) list needs confirmation). | |
| Artemisia campestris L. | in Sg (stand 25) and in alpine zone (P.McIsaac, 14.viii.81) |
| Artemisia michauxiana Bess. | frequent on unstable talus and gravel (Bt,Dg,Sg; stands 11, 25) |
| Artemisia norvegica Fries | on Bird's (1979) alpine list |
| Aster alpinus L. ssp. vierhapperi Onno | frequent in dry tundra and scrub (Td, Tk,Sw; stands 8,12,14,16,17), also in Bt,Fp (stands 11,24) |
| Aster conspicuus Lindl. | occasional in dry forest at lower elevation (Fo,Fp; stands 2,24) |
| Aster sibiricus L. | frequent on dry slopes (Bt,Fp,Ss,Sw; stands 10,11,14,16,24), also on pavement (Td, stand 17) and gravel (Dg) |
| Aster foliaceus Lindl. | common in carr and riverine grassland (Gr,Ma,Mp,Ms; stands 4,9,18,19,23), also frequent in Ss (stand 10) and some forest types (Fl,Fp,Fw; stands 13,21,24) |
| Aster laevis L. | common in Sm (stand 1) |
| Cirsium hookerianum Nutt. | occasional on talus screes (Bt, stand 11) and gravel (Dg) |
| Crepis nana Richards. | on talus screes (Bt) |
| Erigeron aureus Greene | common in Te (stand 22), also noted in Td (stand 8) |
| Erigeron humilis Grah. | in saxifrage-moss community on moist cliffs (NB5-15-4) |
| Erigeron grandiflorus Hook. | on plateau (Tf) |
| Erigeron ochroleucus Nutt. | occasional in Sw (stands 14,16) and on pavement (Td, stand 17), also collected in alpine zone |
| Erigeron debilis (Gray) Rydb. | occasional on talus and gravel (Bt,Dg) |
| Erigeron compositus Pursh | frequent on talus (Bt, stand 11) and in Tf |
| Erigeron peregrinus (Pursh) Greene ssp. callianthemus (Greene) Cronq. | common in heath (Te, stand 22), moist forest (Fo,Fu,Fw; stands 3,5,13,20) and carr (Ma, stand 9) |
| Gaillardia aristata Pursh | common in Sm,Fp (stands 1,24) |
| Haplopappus lyallii Gray | in dry tundra (Td,Tf; stand 8) |
| Hieracium gracile Hook. | on Bird's (1979) alpine list |

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|---|---|
| Saussurea densa (Hook.) Rydb. | frequent on talus (Bt, stand 11) |
| Senecio canus Hook. | frequent in dry scrub and open forest (Fp,Sg,Sm,Sw; stands 1,16,24,25), also on pavement (Td, stand 17) |
| Senecio cymbalarioides Greenm. (= S. resedifolius auctt.) | occasional on plateau (Tf) |
| Senecio streptanthifolius Greene | frequent in Bt,Sg,Ss (stands 10,11, 25), occasional in Sw (stand 14) |
| Senecio fremontii T. & G. | on Bird's (1979) alpine list |
| Senecio pauperculus Michx. | frequent at lower elevation in Fl,Mp, Ms (stands 19,21,23) |
| Senecio triangularis Hook. | local, indicative of wet ground |
| Senecio lugens Rich. | common in tundra (Td,Tk,Tm,Tt; stands 6,7,8,12,15), occasional in scrub, carr and moist forest (Fo,Fw,Ms,Ss; stands 2,10,13,20,23) |

(Bird's (1979) record of the closely related S. integerrimus Nutt. var. exaltatus (Nutt.) Cronq. needs confirmation).

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|---|---|
| Solidago decumbens Greene | common in Fp,Sw (stands 14,16,24), occasional in Sg (stand 25) |
| Solidago multiradiata Ait. | common in wide range of communities at all elevations (Bt,Gr,Ma,Mp,Ms, Sm,Ss,Sw,Td,Te,Tk,Tm,Tt,Fl,Fo,Fw; stands 1,3,6,7,9-23) |
| Taraxacum officinale Weber | on rodent diggings (Ma, stand 4), otherwise mainly on disturbed ground (Dg) |
| Taraxacum ceratophorum (Ledeb.) DC. | weedy along roads in alpine zone |
| Taraxacum lyratum (Ledeb.) DC. | on Bird's (1979) alpine list |
| Townsendia parryi Eat. | occasional in Sw (stands 14,16) and on pavement (Td, stand 17) |

Juncaceae

| | |
|---|---|
| Juncus albescens (Lange) Fern. | collected in alpine zone by P.Lee (20.viii.79) |
| Juncus balticus Willd. var. montanus Engelm. | common in Ma,Mp (stands 4,19) |
| Juncus drummondii Mey. | on damp ground in alpine zone |
| Luzula parviflora (Ehrh.) Desv. | frequent in forest with Phyllodoce understory (Fo,Fu; stands 5,20), occasional in Ma (stands 4,9) |
| Luzula spicata (L.) DC. | common in talus tundra (Tt; stands 6,15) |

Cyperaceae

| | |
|---|---|
| Carex nardina Fries | common in Td (stand 6) and dominant in certain phases of Tf |
| Carex scirpoidea Michx. var. stenochlaena Holm | frequent in Tk (stand 12) and on pavement (Td, stand 17) |
| Carex rupestris All. | occasional on rock and talus (Bt, Sw; stands 11,14) |
| Carex rossii Boott | occasional in forest (Fu,Fw; stands 5,13) |
| Carex concinnoides Mack. | common in closed forest (Fl,Fo,Fw; stands 2,3,13,20,21) |
| Carex albonigra Mack. | common in moist Tt (stand 6), also in Tf |
| Carex atrosquama Mack. | common in Tt (stands 6,15), occasional in Gr (stand 18) |
| Carex atratiformis Britt.ssp. raymondii (Calder) Hors. | common in Ms (stand 23) |
| Carex phaeocephala Piper | on plateau (Tf) |
| Carex microptera Mack. | common in Gr,Mp,Tm (stands 7,18,19), occasional in Ma,Te (stands 4,22) |
| Carex haydeniana Olney | occasional in Te (stand 22) |
| Carex praticola Rydb. | common in Gr,Mp (stands 18,19) |
| Carex gymnoclada Holm | dominant in Tm (stand 7), common in Gr,Ma (stands 9,16) and occasional in Te (stand 22) |
| Carex parryana Dewey | on Bird's (1979) alpine list |

(Records for Carex aquatilis Wahlenb. ssp. stans (Drej.) Hult. and C. tolmiei Boott given by Bird (1979) are unlikely to be correct).

| | |
|---|---|
| Kobresia myosuroides (Vill.) Fiori | dominant in Tk (stand 12), frequent in Gr (stand 18), occasional in Mp (stand 19) and on pavement (Td, stand 17) |
| Kobresia simpliciuscula (Wahlenb.) Mack. | on Bird's (1979) alpine list |

Gramineae

| | |
|---|---|
| Agropyron latiglume (Scribn. & Smith) Rydb. | common on talus (Bt,Ss,Tt; stands 10, 11,15), occasional in Fw,Ma,Sg (stands 4,13,25) |
| Agropyron scribneri Vasey | on plateau and talus screes (Bt,Tf; stand 11) |

| | |
|---|---|
| Agropyron subsecundum (Link) Hitchc. | noted only in Salter Pass (Ms, stand 23) |
| Agropyron trachycaulum (Link) Malte var. majus Vasey | common on valley floors (Gr,Mp,Ms; stands 18,19,23) |
| Bromus pumpellianus Scribn. | common on open ground at all elevations (Gr,Ma,Mp,Sm,Ss,Sw,Td,Tk, Tt; stands 1,4,6,8,9,10,12,15-19) |
| Calamagrostis purpurascens R.Br. | common on dry slopes (Bt,Fp,Sw; stands 11,14,16,24), also in Tk (stand 12) |
| Danthonia intermedia Vasey | common in Gr,Mp (stands 18,19) |
| Deschampsia caespitosa (L.) Beauv. | common in moist Ma (stands 4,9) and Tm (stand 7), also in lakeshore mud (Md) and on moist cliffs (saxifrage-moss community) |
| Elymus innovatus Beal | common in forest (especially Fl,Fp,Fw; stands 13,21,24), scrub (Sg,Sm,Ss,Sw; stands 1,10,14,16,25) and carr (Mp,Ms; stands 19,23) |
| Festuca baffinensis Polunin | frequent on talus and gravel (Bt,Sg, Tf; stands 11,25) |
| Festuca brachyphylla Schultes | frequent on tundra and gravel (Sg,Td, Te,Tf,Tm; stands 7,8,22,25) |
| Festuca saximontana Rydb. | frequent in Gr (stand 18), occasional in Bt,Tk (stands 11,12) |
| Festuca idahoensis Elmer | common in Ms (stand 23), noted also in Sw (stand 14) |
| Festuca scabrella Torr. | dominant in Gr (stand 18) and common in other open ground communities (Mp, Sm,Ss,Sw,Tk,Tt; stands 1,6,10,12,14, 15,16,19), occasional in Ma (stand 9) and on pavement (Td, stand 17) |
| Helictotrichon hookeri (Scribn.) Henr. | frequent on pavement (Td, stand 17) otherwise noted only in Tk (stand 12) |
| Koeleria cristata Pers. | common in Mp (stand 19) and on pavement (Td, stand 17), frequent in scrub (Sm,Sw: stands 1,14,16) |
| Phleum commutatum Gandoger (= P. alpinum auctt.) | frequent in Ma (stands 4,9), occasional in Gr,Fw,Mp (stands 13,18,19) |
| Phleum pratense L. | roadside weed on Bird's (1979) alpine list |
| Poa alpina L. | common in Gr,Sg,Tk (stands 12,18,25), frequent in Ms,Ss,Tt (stands10,15,23), occasional in Fw,Ma,Mp,Te (stands 4,9, 13,19,22) |

| | |
|---|---|
| Poa grayana Vasey | common in carr (Ma,Mp,Ms; stands 4,9, 19,23) and moist Tt (stand 6) |
| (included in P. arctica R.Br. by some authors, as in Bird's (1979) list) | |
| Poa pattersonii Vasey | frequent in tundra and talus barren (Bt,Td,Te,Tt; stands 8,11,15,22) |
| Poa rupicola Nash | frequent in tundra and talus barren (Bt,Te,Tt; stands 11,15,22) |
| Poa interior Rydb. | frequent on open ground (Ma,Ms,Sm,Ss, Sw,Td,Tk,Tt; stands 1,4,6,10,12,15,16, 17,23), occasional in Fo (stand 2) |
| Poa pratensis L. | common on valley floors (Gr,Mp,Ms; stands 18,19,23) |
| Poa cusickii Vasey var. epilis (Scribn.) Hitchc. | confirmed only in Fu (stand 5) |
| Poa canbyi (Scribn.) Piper | frequent in Tk (stand 12) |
| (Records for Poa compressa L. and P. hartzii Gand. given by Bird (1979) are unlikely to be correct). | |
| Trisetum spicatum (L.) Richter | frequent in Bt,Fw,Td (stands 8,11,13), occasional in Gr (stand 18) |
| Liliaceae | |
| Allium cernuum Roth | frequent in dry forest and scrub (Fl, Fp,Sm,Ss,Sw; stands 1,10,14,16,21,24), occasional in Tt (stand 6) |
| Allium schoenoprasum L. | common in Ma (stands 4,9) and moist tundra (stands 6,7,12) |
| Smilacina stellata (L.) Desf. | frequent in Sm (stand 1) |
| Stenanthium occidentale Gray | frequent in forest in lower subalpine zone (Fl,Fo; stands 2,3,20,21) |
| Zygadenus elegans Pursh | common in dry tundra and scrub (Sw,Td, Tk; stands 8,12,14,16,17), occasional in Ma.Tt (stands 4,6,9) |

## PLATEAU MOUNTAIN CANDIDATE ECOLOGICAL RESERVE

### Faunal Notes - 1982

by Deirdre E. Griffiths

Although faunal records were not the primary objective of the 1982 study, I kept field notes of all observations and present these in the following summary.

1. Mammals

Scientific names are from the Mammals of Alberta (1964) by W. Henry Soper.

Pika (Ochotona princeps)

Pikas were widely distributed on suitable habitat (slopes of large boulders interspersed with partially vegetated finer rock and scree) from elevations of 6600 to 7800 feet (2073-2376 m). Suitable slopes were occupied regardless of aspect.

Hoary Marmot (Marmota caligata)

This species appeared to be restricted to the east face of Plateau Mountain on well-vegetated mesic to moist talus slopes in the large cirques, and the limestone pavement area. At Phillips Plateau (the northernmost site well) they were common from elevations of 7100 to 7500 feet (2165-2286 m).

Belding's Ground Squirrel (Citellus columbianus)

This species was common and widely distributed in a variety of open habitats from 5700 to 7900 feet (1738-2408 m). The main requirement appeared to be well-drained ground (at most seasonally wet during snowmelt) with a sufficient depth of fine loose soil to allow easy burrowing and abundant herbaceous vegetation. Specific vegetation types in which this species was recorded were: Kobresia tundra (Mk), moist talus tundra (Mt. quadrat 6), Krummholz, riverine fescue grassland (Gr), shrubby cinquefoil carr (Sp), herb-willow carr (Sh), willow-dwarf birch carr (Sb), subalpine and montane scrub (Sm, Ss, Sw).

Mantled Ground Squirrel (Citellus lateralis)

Only three were recorded. One was seen on the rubble and talus tundra slopes above the lake at Phillips Plateau (7200 feet = 2195 m) on August 15; one near the main access road (W side of Plateau Mountain) in an area of Dryas and Kobresia tundra interspersed with patches of gravel and rubble (7700 feet = 2347 m) on August 16; and another on the valley floor in Salter Pass in gravel bar scrub (5900 feet = 1799 m) on August 19.

Timberline Chipmunk (Eutamias minimus oreocetes)

This species was quite common in various mesic to xeric scrub habitats with surface rubble from 5900 feet (1799 m) in Salter Pass to 7900 feet (2408 m) in krummholz at the north end of Plateau Mountain. One immature was observed drinking at the lake (Phillips Plateau) on August 15.

Buff-bellied Chipmunk (Eutamias amoenus)

Positive identification of this species was not made; however, a population of chipmunks in the valley of Dry Creek appeared to be more richly coloured (buffy) and slightly larger than the timberline chipmunks in the same area. The buff-bellied inhabited the lower slopes consisting of rubbly screes interspersed with xeric scrub vegetation of herbs, low shrubs and scattered trees (6800-6900 feet = 2073-2103 m).

Red Squirrel (Tamasciurus hudsonicus)

Despite large areas of apparently suitable forest, this species was rare in the reserve in 1982. The only individual recorded was in upper subalpine spruce-fir-whitebark pine forest (Fw) in the vicinity of quadrat 13 (7000 feet = 2134 m) on the east side of Plateau Mountain).

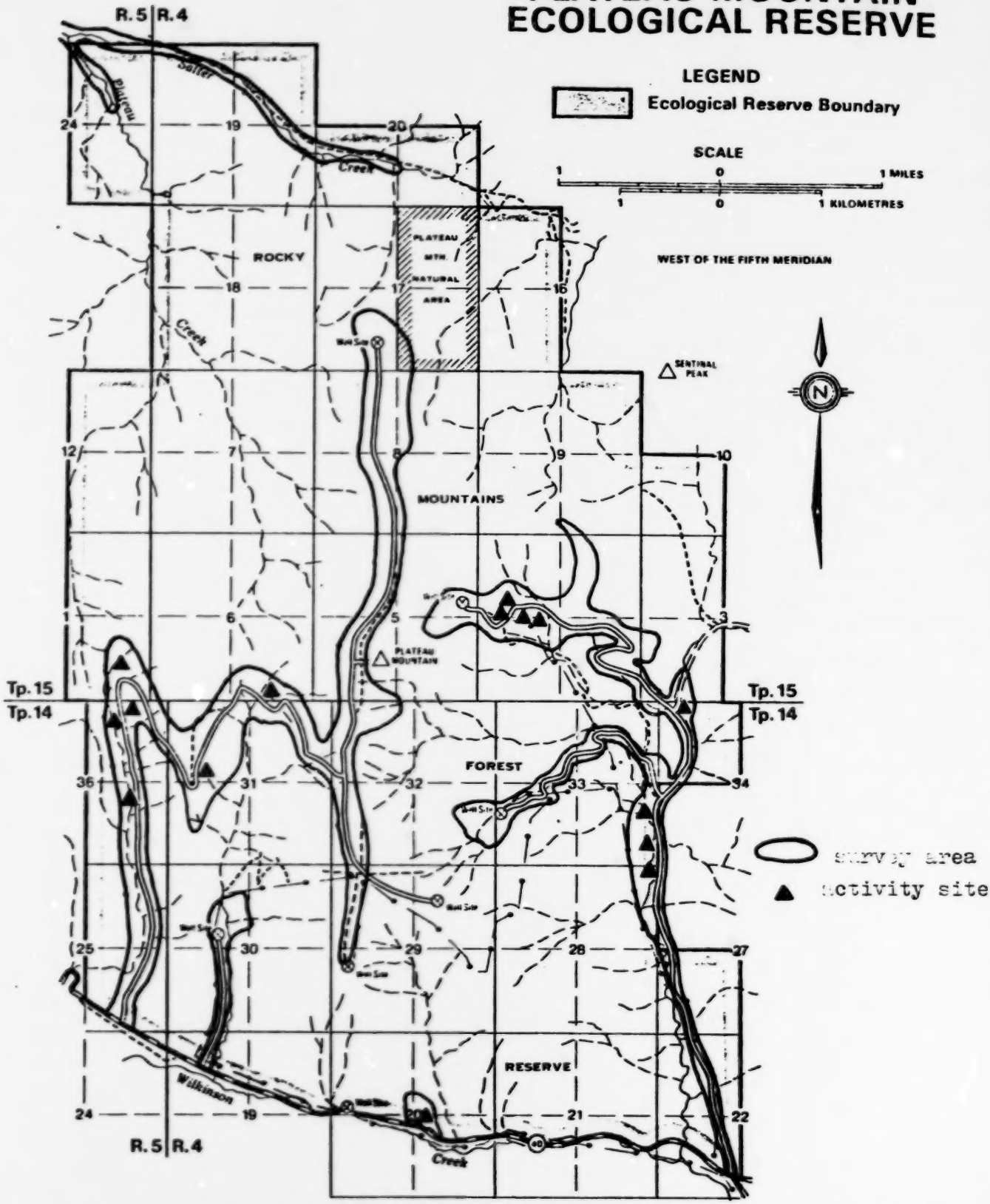
Pocket Gopher (Thomomys talpoides)

Although apparently not previously recorded for the Plateau Mountain area, this species was widely distributed and quite common. In some places it occurred with the Columbian ground squirrel, and the general similarity of the summer earth mounds of the two species could well have caused the pocket gopher to have been overlooked in the past. However, ground squirrel diggings are always associated with an open burrow entrance, whereas this is rarely the case with pocket gophers whose activity is almost exclusively subterranean. An example of earth "ropes" deposited under snow and diagnostic of pocket gopher activity has been photographed.

Specific sites where pocket gophers were present are shown on the accompanying map.

Like the ground squirrel, the pocket gopher requires a predominance of fine fairly loose soil under a dense cover of herbaceous vegetation (with shrubs and trees, if present, not so dense as to shade out the ground cover). Specific vegetation types in which the species was recorded were: Kobresia tundra (Tk), moist talus tundra (Tt, quadrat 6), dryas tundra (Td), riverine fescue grassland (Gr), herb-willow carr (Ha), shrubby cinquefoil carr (Hp), subalpine and montane scrub (Sm, Ss, Sw).

Elevational range in the reserve extended from 6400 to 7700 feet (1951-2347 m). This may represent a vertical extension for Alberta. Soper (Mammals of Alberta) mentions the pocket gopher as being abundant in the Highwood River valley west of Longview but not at an elevation exceeding 4700 feet (1433 m) anywhere in the province. More recently the species has been seen up to 6000 feet (1829 m) in the vicinity of the University of Calgary research station west of Turner Valley (Jan Murie, University of Alberta, personal communication). However, all occurences in the Plateau Mountain reserve were well above this level. The Mammals of British Columbia (1955) states for the species: "where suitable soils occur, it ranges from valley-bottom to the alpine meadows". Thus its distribution up to and above timberline on Plateau Mountain is not entirely unexpected. However, since high elevation populations are not previously reported in this province, this one should be studied in detail, with additional surveys made to see if the species occurs at high elevation elsewhere in SW Alberta. The




Observations of pocket gopher (Thomomys talpoides) activity, 1982

Plateau Mountain populations belong almost certainly to T. t. talpoides, not to T. t. cognatus which occurs only through the Crowsnest Pass at elevations up to 5200 feet (1585 m).

Wapiti or Elk (Cervus canadensis nelsoni)

This species is not numerous in the reserve, but appears to be widely distributed on both east and west slopes of the plateau. Occasional trails with fresh tracks and droppings were encountered in upper subalpine forests (7100-7500 feet = 2165-2286 m). The only sighting was of a cow and another individual (not seen clearly) near Phillips Plateau on the morning of August 15. The scarcity of surface water may be one reason for the low population.

Mule Deer (Odocoileus hemionus)

This species was also uncommon but widely distributed. Sightings occurred in upper subalpine spruce-fir-larch forest (Fu, 7300 feet = 2225 m) and in the main Livingstone Valley (6300 feet = 1920 m).

Bighorn Sheep (Ovis canadensis)

This species was most numerous on the plateau (7000-8200 feet = 2400-2500 m), but was also seen down to 7100 feet (2165 m) in Phillips Plateau cirque where they descended to drink at the lake. Tracks and droppings were also noted on the west side of Plateau Mountain, where there was a small permanent stream at 7300-7500 feet (2225-2286 m).

A young ram (probably 4-5 years old, with horns at half-curl stage) was observed feeding and resting on talus tundra slopes above the lake for nearly two hours on August 13. All other sheep seen were adult females, lambs and yearlings or two-year olds.

On a trip to the plateau crest on August 16th, three separate groups were seen: 3 ewes with 3 lambs near the radio tower (at south end of plateau); a flock of 18 (6 ewes, 4 lambs, 8 yearlings) near the north end of the plateau; and a flock of 30 (12 ewes, 11 lambs, 6 yearlings) about 1 km further south.

## 2. Birds

The reference used for standard common names and sequence of species is: The Birds of Alberta (1976) by W.R. Salt and J.R. Salt.

Red-tailed Hawk

One adult was observed on August 13, perched in a tree beside the access road to Phillips Plateau (gas well) at about 5500 feet (1680 m).

Golden Eagle

There may have been three individuals sighted, but more probably only two. A subadult (with considerable white in wings and tail) was seen several times (both in July and August) in the vicinity of cliffs along the deep narrow upper valley of Dry Creek, over tundra at the head of the valley and also circling above the cliffs at Phillips Plateau (gas well). On August 16 an adult cruised over the north end of Plateau Mountain. No evidence of any nest was found.

Marsh Hawk

On August 13 one immature was seen flying low over arctic tundra at Phillips Plateau (see map). It appeared to be hunting. On August 16 two immatures spent at least half an hour over a tundra swale and stru Holz area at the north end of Plateau Mountain (7600 feet = 2375 m). They hunted, but also appeared to engage in "play" flight. Later that same day an adult female flew south over the middle west of the main plateau (towards the valley of Dry Creek).

American Kestrel

On August 16 an adult female was observed on top of Plateau Mountain. She alternately flew short distances (once hovering as there was only a light breeze) and perched.

Spruce Grouse

On July 21 a female with at least 4 chicks (12-14 days old) was encountered in valley bottom forest (Fo) along Plateau Creek (3000 feet = 1700 m).

White-tailed Ptarmigan

Single birds were seen, but later sightings were noted in open upper subalpine spruce-fir-whitebark pine forest (sW) near rubble fields (see map).

Mount Leonard Owl

On August 20 was heard calling several times from the lower Plateau Creek valley.

Common Snipe

All individuals definitely believed to be mid-migrated adult males. Females not observed, but may contribute in open forest or dry sloughs.

Spotted Sandpiper

On August 17 one was seen and heard calling in dense willow thickets at the head of a swamp-filled (rec.) section of the Davidson River just north of the Forestry trail road.

Horned Lark

This species was not very common, but was found in preferred tundra (Td) (7400-7800 feet = 2254-2315 m). On July 24 an adult was observed with fledglings, but no nest was found. Adults were still present on August 16.

Gray Jay

This species was common and widely distributed in most forest types from 5700-7500 feet (1736-2284 m). The birds travelled in small groups of 3-5. And by August all were in adult plumage. A bird seen on July 22 was in transition from juvenile to adult plumage.

Common Raven

This species was not seen in July. In August a family group of 5 frequented the lower Plateau Creek area. A second group of 3 was seen twice along the south boundary of the reserve (Forestry Trunk

hood) in an old burn. I do not know if they nested within the reserve.

Clark's Nutcracker

Like the gray jay this species was common and widespread, moving about in small groups of 2-3 birds. They preferred open forest near timberline and were rarely seen below 7000 feet (2132 m).

Mountain Chickadee

This was the second most widely distributed chickadee. It occurred in all types of continuous forest except xeric pine forest (Fp) up to almost 7500 feet (2264 m). Juvenals, which were present along with other small birds in patchy forest and krummholz above the rim of a deep cirque at the north end of Plateau Mountain (7000 feet = 2175 m). Groups in July consisted of 3-4 birds each; those in August of 4-6 birds.

Boreal Chickadee

I recorded this species only twice. On August 13 2-3 were calling in wet subalpine spruce-fir-whitebark pine forest (Fw) (7000 feet = 2134 m) near Phillips Plateau (as well). On August 18 a group of 3-4 were feeding and calling in scattered spruce at the edge of willow-heard birch carr (as quadrat 23) in Salter Peak (7000 feet = 1644 m).

Red-breasted Nuthatch

This species was encountered almost exclusively in mature subalpine spruce-fir forest (Fs, quadrats 2 on Plateau Creek and 20 in the Livingstone Valley). Additionally on August 18 one was seen with an area flock of small birds in krummholz at the north end of Plateau Mountain (7000 feet = 2134 m).

American Pipit

Although seen quite frequently, this species was not numerous. At lower elevations the birds preferred stream valleys and open forest. Above timberline there appeared to be a small population nesting in tundra and krummholz; for instance, a female was observed gathering food near quadrat 8 (alpine tundra at 7500 feet, = 2264 m) on July 24.

Varied Thrush

Several were heard singing in dense mature subalpine spruce-fir forest (near quadrat 2 at 5700 feet, = 1736 m) on July 21. This was the only record of the species.

Hermit Thrush

By contrast this species was quite common, both in climax spruce-fir forest and subclimax stands with admixture of lodgepole pine (as quadrat 3).

Townsend's Solitaire

The only area in which this species was seen was seral scrub with scattered trees (Ss) (burnt at least 50 years ago) in the upper valley of Dry Creek (6900-7100 feet = 2103-2165 m).

Ruby-crowned Kinglet

This species was positively identified only once, although probably more common than it appeared. On August 16 an immature was seen with a flock of Mountain Chickadees and immature Audubon's Warblers in subalpine spruce-fir forest beside the access road along the Livingstone Valley.

Water Pipit

This species was common and widely distributed on mesic to moist tundra (T., T.) above 7000 feet (2134 m). Adults carrying food were noted on the July visit (21-26). Independent immatures were seen in August (13-19).

Yellow-rumped (Audubon's) Warbler

This species was quite common and widely distributed. It is more strictly a forest species but prefers to be near edges or in forest of irregular density. Dense spruce-fir forest (Fo) was avoided during full nesting. Pairs appeared to be more common in upper subalpine forests than in denser lower subalpine stands. Independent immatures were frequent in August (though some still in family groups). On August 16 at least 10 immatures and a few adults were part of a mixed flock of small birds in an area of Krummholz (7000 feet = 2378 m) near the edge of a bull bird in an area of Krummholz (7000 feet = 2378 m) at the north end of Plateau Mountain.

Townsend's Warbler

The only record was of a young but apparently independent juvenile in open pine forest (Pf) in the Sulphur Pass on August 15.

White-crowned Sparrow Finch

This species was recorded only on August 16 on and near the summit of Plateau Mountain. Two flocks were noted, one of 6 and one of 4 birds.

Pine Siskin

This was one of the commonest species seen in the reserve. The birds were most often noticed when they passed overhead calling. Groups ranged from pairs to 6 birds (mostly pairs in July). They were always associated with forest, from valley bottoms to timberline.

Red Crossbill

This species was quite common and widely distributed, primarily in subalpine forest. Except for one male singing on territory in spruce-fir-larch forest (Fu)(quadrat 5, 7200 feet = 2195 m) on July 23, all birds seen were in small flocks of 6-10 birds each.

Dark-eyed Junco

This was probably the most numerous bird species in the reserve. All individuals seen belonged to the slate-coloured subspecies. They were associated with open forest of various types (from valley bottom to timberline), forest edges and roadsides. In July males singing on territory were characteristic. In August small flocks of 5-10 birds, made up of family groups or all immatures, were the rule. On August 17 a female was seen feeding a full-grown fledgling at the edge of spruce-fir forest, and on August 18 another female was feeding a

young bird in krummholz at the north end of the plateau. There were also 10 or more independent immatures in the same habitat.

Chipping Sparrow

Chipping sparrows were not recorded until August, although it is possible that some singing in July should have been attributed to this species. By August 13 flocks of immatures (6-20 birds each) were common along roads and cutlines and scree slopes. Several were present in the mixed assemblage of small birds in krummholz at the north end of the plateau on August 18.

Brewer's Sparrow

The identification of this species remains tentative. On August 18 there were 20-30 (all in juvenal plumage) in an area of krummholz at the north end of Plateau Mountain. While distinctly different in plumage from chipping sparrows, they were difficult to examine closely as they spent most of their time hidden in thick foliage or on the ground beneath.

White-crowned Sparrow

This species was only locally common because of restriction of its apparently preferred nesting habitat - herb-willow carr with scattered trees close to surface water and above 7200 feet (2195 m). Nesting sites were present on the west side of the reserve near quadrat 9 (above Baron Creek) and near the lake at Phillips Plateau (as well). On August 18 several immatures were part of the mixed assemblage of small birds in the krummholz at the north end of Plateau Mountain.

Fox Sparrow

This species was even more limited in its breeding distribution than the preceding, being present only on the slope in the vicinity of quadrat 9. Males were singing on territory in July. On August 18 one immature was part of the mixed assemblage of small birds in krummholz at the north end of Plateau Mountain.

Summary

A total of 31 species of birds in 15 families was recorded during two field trips in 1982. Their abundance is summarized as follows:

very common (2 spp.) - pine siskin, dark-eyed (slate-coloured) junco

common (6 spp.) - gray jay, Clark's nutcracker, mountain chickadee, hermit thrush, water pipit, yellow-rumped (Audubon's) warbler, red crossbill, white-crowned sparrow (locally)

uncommon to rare (15 spp.) - spruce grouse, great-horned owl, common flicker, western flycatcher, horned lark, boreal chickadee, red-breasted nuthatch, American robin, varied thrush, Townsend's solitaire, ruby-crowned kinglet, MacGillivray's warbler, gray-crowned rosy finch, Brewer's sparrow, fox sparrow

visitors (no evidence of nesting) (6 spp.) - red-tailed hawk, golden eagle, marsh hawk, American kestrel, common raven, chipping sparrow

3. References

McTaggart-Cowan, I. & C. S. Guiget. 1956. The Mammals of British Columbia. Provincial Museum. Victoria, B.C. 413 pp.

Salt, W. R. & J. R. Salt. 1976. Birds of Alberta. Hurtig Publishers, Edmonton, Alberta. 498 pp.

Soper, J. D. 1964. Mammals of Alberta. The Hamly Press Ltd., Edmonton, Alberta. 402 pp.

R. 5 | R. 4

25 | 30 | 29 | 28

19 | 21

Plateau

Creek

Salter Creek

PLATEAU

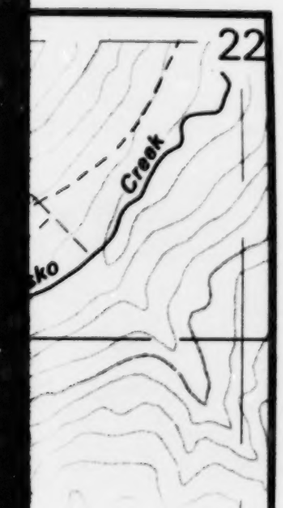
# PLATEAU MOUNTAIN ECOLOGICAL RESERVE

## VEGETATION MAP

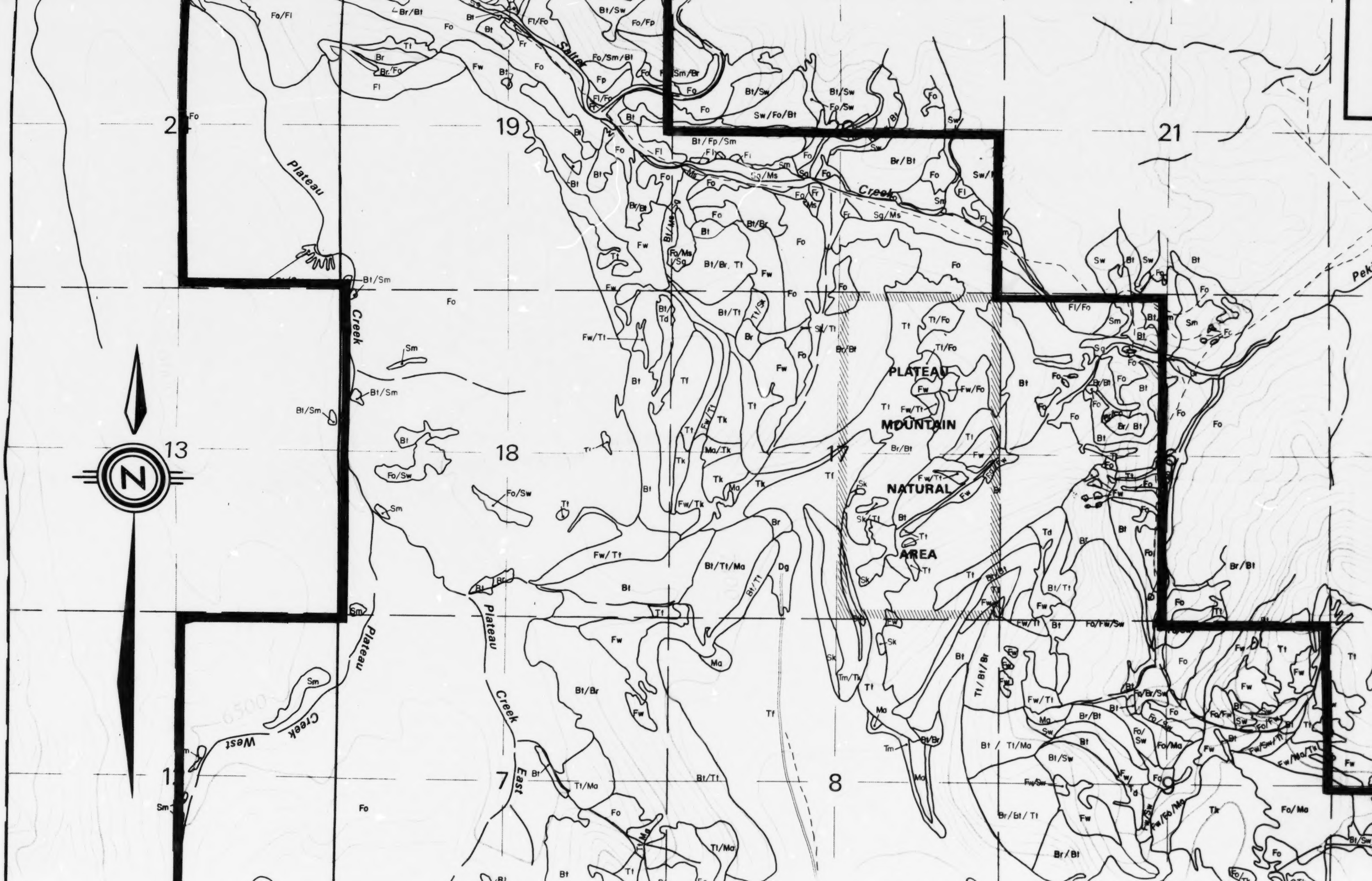
## WEST OF THE FIFTH MERIDIAN

## SCALE 1: 15 000

### LEGEND




| VEGETATION TYPES | ABBREV-IATION | ASSOCIATED SOILS |
|---|---|---|
| **1. Barrens (less than 15% vegetated)** | | |
| (i) lichen-rock barren | Br | none (bedrock) |
| (ii) talus barren | Bt | none (talus) |
| **2. Tundra** | | |
| (i) fellfield tundra | Tf | orthic/brunisolic turbic cryosol |
| (ii) moist hummocky tundra (dominated by Carex gymnoclada) | Tm | brunisolic turbic cryosol |
| (iii) alpine heath (dominated by Phyllodoce glanduliflora) | Th | orthic regosol |
| (iv) dryas tundra (dominated by Dryas octopetala ssp. hookeriana) | Td | orthic regosol or none (pavement) |
| (v) talus tundra | Tt | orthic regosol or orthic eutric brunisol |
| (vi) kobresia tundra (dominated by Kobresia myosuroides) | Tk | orthic regosol |
| **3. Grassland** | | |
| (i) riverine fescue grassland (Festuca scabrella - Geum triflorum) | Gr | orthic black chernozem |
| **4. Carr/marsh/meadow** | | |
| (i) herb-willow carr (Salix glauca - Aster foliaceus - Allium schoenoprasum) | Mw | rego black chernozem |
| (ii) shrubby cinquefoil carr (Potentilla fruticosa - Danthonia intermedia | Mp | rego/orthic black chernozem |
| (iii) willow - dwarf birch carr (Salix glauca - S. farrae - Betula glandulosa) | Mb | orthic eutric brunisol |
| (iv) hairgrass community (Deschampsia caespitosa - Rorippa sp.) | Md | unknown (alluvial mud) |
| **5. Scrub (with tree coverage not exceeding 15%)** | | |
| (i) krummholz | Sk | unknown |


PLATEAU
MOUNTAIN
NATURAL
AREA
Plateau Creek
Plateau Creek West
Plateau Creek East
Salter Creek
Peki
13
18
19
21
7
8
N
Fo/Fl
Br/Bt
Bt
Fl/Fo
Bt/Sw
Fo/Fp
Fo/Sm/Bt
Br
Br/Fo
Fl
Fw
Fp
Sm/Br
Fo/Sw
Sw/Fo/Bt
Bt/Fp/Sm
Sg/Ms
Bt/Br
Fo/Ms/Sg
Bt/Br, Tf
Bt/Tf
Fw/Tf
Bt/Td
Sk/Tf
Tf/Fo
Fw/Fo
Fw/Tf
Tk
Mo/Tk
Fw/Tk
Bt/Tf/Ma
Dg
Bt/Tf
Tm/Tk
Tm
Bt/Sm
Sm
Fo/Ma
Br/Bt/Tf
Fw/Br/Sw
Fo/Fw
Fo/Sw
Fw/Fo/Ma
Fw/Ma/Tk
Fo/Fw/Sw
Fw/Br/Bt
Br/Bt/Tf
Fw/Sw
Fw/Fo/Sw
Fo/Tk
Bt/Sw
Fo/Sw
Sw
Sw/Fo
Br/Bt
Sw/Fl
Fl/Fo
Bt/Sm
Fo/Sw
Fw/Tf
Fw/Tk
Bt/Tf/Ma
Bt/Br
Fw/Tf
Bt/Tf
Tf/Ma
Fo/Ma
Br/Bt/Tf
Fw/Tf
Br/Bt
Fo/Fw/Sw
Fw/Br/Sw
Fo/Fw
Fo/Sw
Fw/Fo/Ma
Fw/Ma/Tk
Fo/Ma
Br/Bt

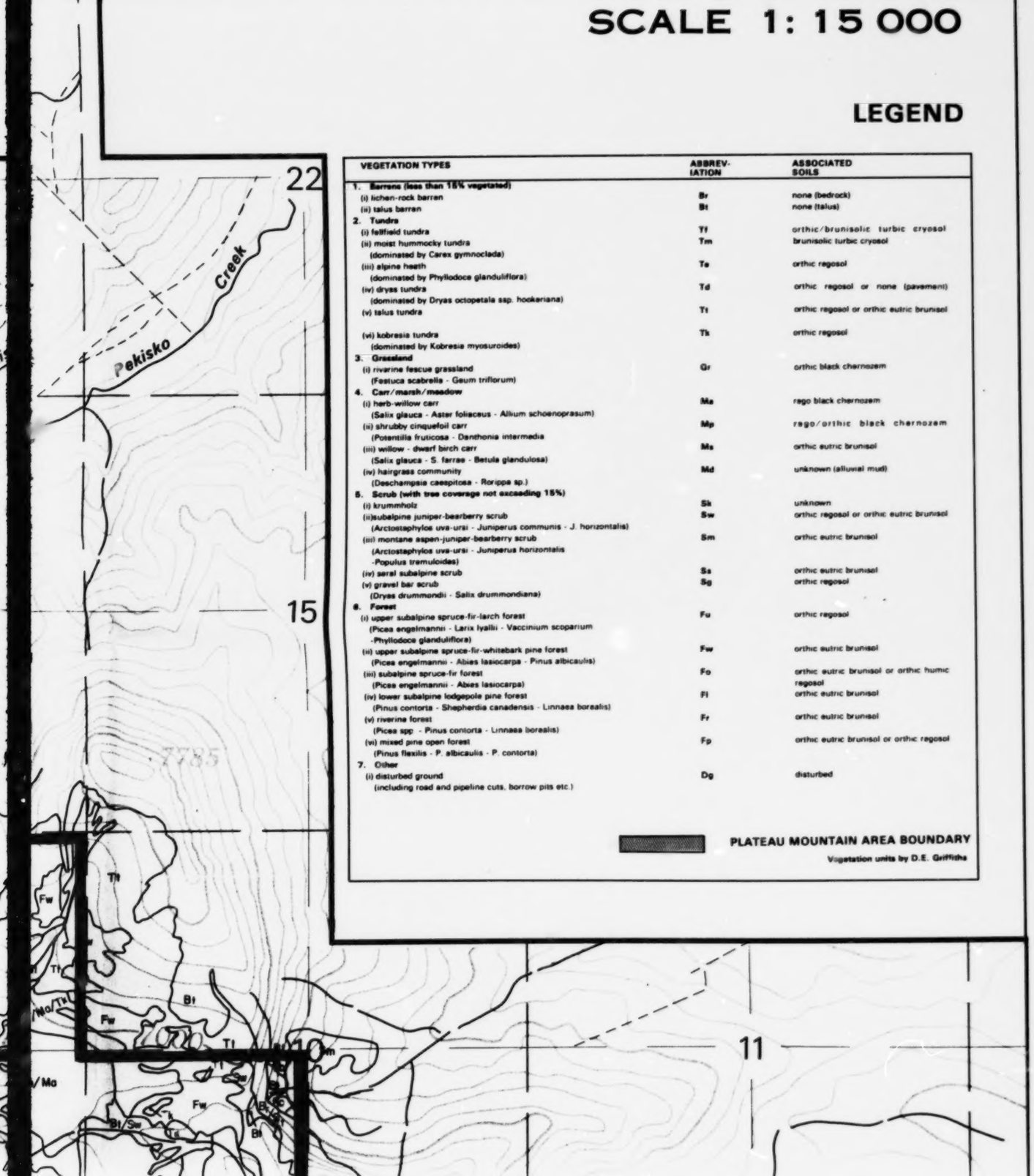
# SCALE 1: 15 000

## LEGEND

| VEGETATION TYPES | ABBREV-IATION | ASSOCIATED SOILS |
|---|---|---|
| **1. Barrens (less than 15% vegetated)** | | |
| (i) lichen-rock barren | Br | none (bedrock) |
| (ii) talus barren | Bt | none (talus) |
| **2. Tundra** | | |
| (i) fellfield tundra | Tf | orthic/brunisolic turbic cryosol |
| (ii) moist hummocky tundra (dominated by Carex gymnoclada) | Tm | brunisolic turbic cryosol |
| (iii) alpine heath (dominated by Phyllodoce glanduliflora) | Te | orthic regosol |
| (iv) dryas tundra (dominated by Dryas octopetala ssp. hookeriana) | Td | orthic regosol or none (pavement) |
| (v) talus tundra | Tt | orthic regosol or orthic eutric brunisol |
| (vi) kobresia tundra (dominated by Kobresia myosuroides) | Tk | orthic regosol |
| **3. Grassland** | | |
| (i) rivarine fescue grassland (Festuca scabrella - Geum triflorum) | Gr | orthic black chernozem |
| **4. Carr/marsh/meadow** | | |
| (i) herb-willow carr (Salix glauca - Aster foliaceus - Allium schoenoprasum) | Ma | rego black chernozem |
| (ii) shrubby cinquefoil carr (Potentilla fruticosa - Danthonia intermedia | Mp | rego/orthic black chernozem |
| (iii) willow - dwarf birch carr (Salix glauca - S. farrae - Betula glandulosa) | Ms | orthic eutric brunisol |
| (iv) hairgrass community (Deschampsia caespitosa - Rorippa sp.) | Md | unknown (alluvial mud) |
| **5. Scrub (with tree coverage not exceeding 15%)** | | |
| (i) krummholz | Sk | unknown |
| (ii)subalpine juniper-bearberry scrub (Arctostaphylos uva-ursi - Juniperus communis - J. horizontalis) | Sw | orthic regosol or orthic eutric brunisol |
| (iii) montane aspen-juniper-bearberry scrub (Arctostaphylos uva-ursi - Juniperus horizontalis -Populus tremuloides) | Sm | orthic eutric brunisol |
| (iv) seral subalpine scrub | Ss | orthic eutric brunisol |
| (v) gravel bar scrub (Dryas drummondii - Salix drummondiana) | Sg | orthic regosol |
| **6. Forest** | | |
| (i) upper subalpine spruce-fir-larch forest (Picea engelmannii - Larix lyallii - Vaccinium scoparium -Phyllodoce glanduliflora) | Fu | orthic regosol |
| (ii) upper subalpine spruce-fir-whitebark pine forest (Picea engelmannii - Abies lasiocarpa - Pinus albicaulis) | Fw | orthic eutric brunisol |
| (iii) subalpine spruce-fir forest (Picea engelmannii - Abies lasiocarpa) | Fo | orthic eutric brunisol or orthic humic regosol |
| (iv) lower subalpine lodgepole pine forest (Pinus contorta - Shepherdia canadensis - Linnaea borealis) | Fl | orthic eutric brunisol |
| (v) riverine forest (Picea spp - Pinus contorta - Linnaea borealis) | Fr | orthic eutric brunisol |
| (vi) mixed pine open forest (Pinus flexilis - P. albicaulis - P. contorta) | Fp | orthic eutric brunisol or orthic regosol |
| **7. Other** | | |
| (i) disturbed ground (including road and pipeline cuts, borrow pits etc.) | Dg | disturbed |

**PLATEAU MOUNTAIN AREA BOUNDARY**

Vegetation units by D.E. Griffiths



Plateau Creek West

Plateau Creek East

AREA

8

7

6

5

4

TP.15

TP. 14

| | | |
|---|---|---|
| (iv) lower subalpine lodgepole pine forest<br>(Pinus contorta - Shepherdia canadensis - Linnaea borealis) | Fl | orthic eutric brunisol |
| (v) riverine forest<br>(Picea spp - Pinus contorta - Linnaea borealis) | Fr | orthic eutric brunisol |
| (vi) mixed pine open forest<br>(Pinus flexilis - P. albicaulis - P. contorta) | Fp | orthic eutric brunisol or orthic regosol |
| 7. Other<br>(i) disturbed ground<br>(including road and pipeline cuts, borrow pits etc.) | Dg | disturbed |

**PLATEAU MOUNTAIN AREA BOUNDARY**

Vegetation units by D.E. Griffiths

TP.15

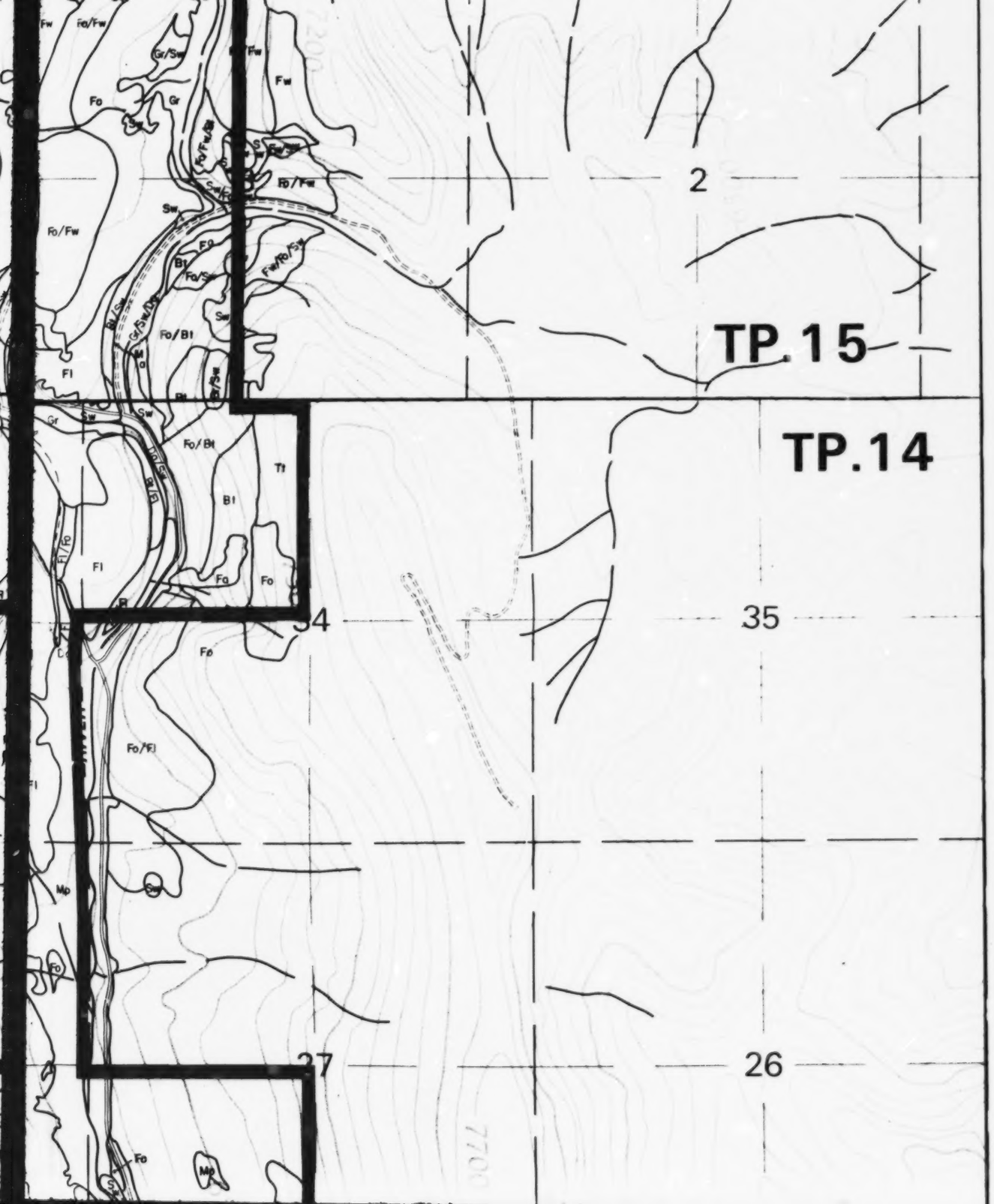
TP.14

TP.15

TP. 14

Larch Creek

Dry


TP.15
TP.14
2
34
35
27
26
Fw
Fo/Fw
Fo
Sw
Gr
Gr/Sw
Fo/Fw
Fo/Bt
Bt
Fl
Mp
Fo/Fl
Fo/Bt/Sw
Fw/Fo/Sw
Bt/Sw
Fl/Fo
Fo/Mp
Fo/Sw
Bt/Fo
Fo/Fw/Bt
Gr/Sw/Bt
Fo/Bt/Sw
Fo/Fl
Fo/Mp
Fo
Fo
Fo

Larch Creek

Dry Creek

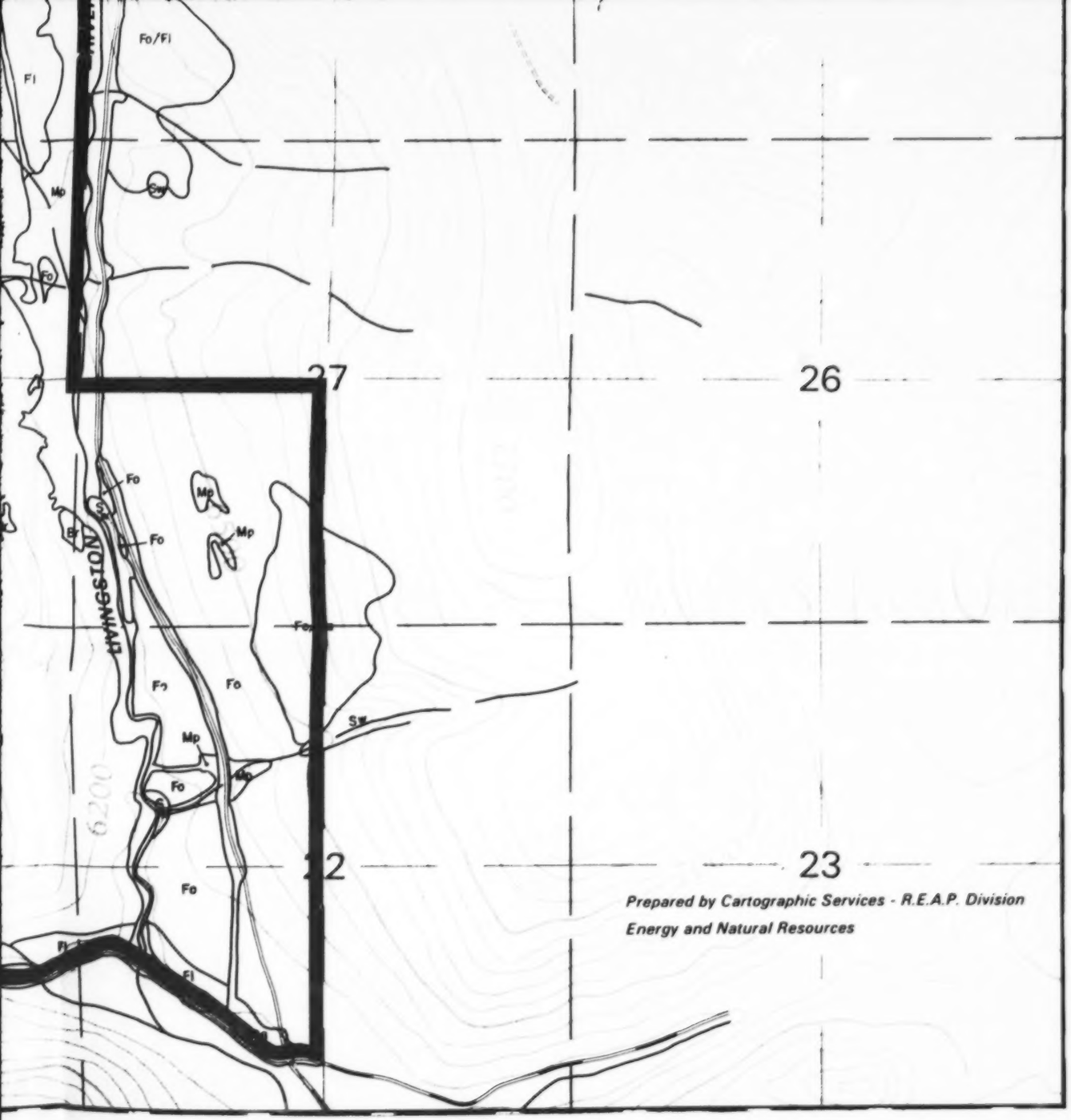
Dry Creek

25 30 29 28

24 19 20 21

R.5 R.4

Fw Td Tm Fw/Tf Tf/Fw Tf/Ma Bt/Tf Br Sw Br/Sw Tf Ss Tf/Ma Bt/Tf Td Dg Ma Bt Fo/Ss Fw/Ss Fw/Tf Fo Bt/Br Bt/Tf Tk Tk/Fw Fw/Tf Fw/Sw Tf/Bt Tk/Td Fw/Tk Fw/Ma Fw/Sw Fw/Tf Tf/Ma/Fw Bt/Sw Bt/Fo Fo/Sw Fo/Sw Sm Fo Bt Fo Fo




*Prepared by Cartographic Services - R.E.A.P. Division*
*Energy and Natural Resources*

POOR

QUALITY

ORIGINAL